¶ A Regiment for the Sea: Conteynyng most profitable Rules, Mathematical experiences, and perfect knowledge of Nauigation, for all Coastes and Countreys: most needful and necessary for al Seafaryng men and Trauellers, as Pilotes, *Mariners, Marchaunts. &c.*

Exactly deuised and made, *by* William Bourne.

¶ Imprinted at London, nigh vnto the three Cranes in the Vintree, by Thomas Dawson,

¶TO THE RIGHT HONOURABLE, Edwarde Earle of Lincolne, *Baron of Clinton and Say, knight* of the Noble order of the Garter, Lord high Admirall of England, Ireland, and Wales, and of the Dominions and Iles therof, of the *Towne of Calice, and Marches of the same, Normandie, Gascoygne, and Guyone, and Captayne* generall of the Queenes Maiesties Seas and Navie Royall, *William Bourne wisheth increase of Honour, in perfect healthe.*

Right honorable, and my singular good Lord and Mayster, when I had often repeted and called to my remembrance the opinion and sayings of the sage and auncient Writers, that one man shoulde be an instructer to another, by seeking and paynes taking to doo them good: so at sundry tymes have I studyed and devised with my selfe what thyng to take in hand that might most profite my freendes, and my native Countrey: and at the length it came vnto my remembraunce howe necessary a thyng it was for Seafaring men to have some good instructions: whereupon I have written this base and simple Regiment for the Sea, and Rules of Navigation, for that I knowe it to be so needefull and necessary for al sortes of Seamen. Therefore at sundry tymes as I have had leysure, I have compi-

led and written this base and simple woorke, calling to remembraunce the saying of Plinie, who thought all tyme lost, whiche he dyd not bestowe at his booke: I being of all other most simple, yet notwithstanding this enterprise haue I taken in hand, to publishe this simple booke vnto all men.

And for that all my labours be due vnto your Honorable Lordship, according to my bounden duetie I preferre it vnto your Honour, hoping that your Lordship wyll vouchsafe to take it in good part, and to receyue this barbarous woorke, more to take it as my good wyll (which is to offer things of much more excellencie) than the fineneſſe of the woorke, for that it is but simple. And so shall I not onely be satisfied, but also further encouraged hereafter to trauell, accordyng to the simple gift and talent that God hath giuen vnto mee: for that it is not altogether gathered out of other bookes, but that the greatest part is deuised and practised by mee. Therefore I trust my labours (such as they be) shall not hynder the cunnyng and learned sort, but further the late beginners, that are as yet not well instructed. And thus I ceasse to trouble your honorable Lordship any longer, desiring you to take this simple thing in good part, as a true token and signe of my good wyll, beseeching God of his grace to prosper your Lordship in honour and vertue, with perfect health. Amen.

By your Honors poore seruaunt, *William Bourne.*

IN my opinion (gentle Reader) which also is the saying and writyng of all the Philosophers, those things are moste principally too be taught and maynteined, whiche in the common wealth are most profitable and necessarye. Then maye I boldly say (without iust cause of reproofe) and affirme, that Nauigation is not the leaste, but one of the principall matters to be knowne, as this tyme dooth require: Considering the state and scituation of our countrey, for that wee be inuironed rounde aboute with the Sea, so that wee neyther canne goe out of our countrye, neyther they that are of other countries, can come at vs, but only by Sea. These things (I say) considered, what can there be more necessary to be taught in our common weale, than Nauigation, considering also what Nauigation is: as Nauigation is how to direct ones course vpon or thorow the sea, where he findeth no path to any place assigned, and how to attayne the port or place appoynted in shortest tyme, how also to preserue the ship and goodes in all common disturbances, as stormes, daungers by the way, and such other like: &c. Moreouer and besides that, it is not vnknowne how necessary Nauigation is, both for the transportation of our commodities, to finde vent for them in other countries (wherby no small number of people is set a worke in England) and also the bringing of other commodities (that we haue neede of) vnto vs, by which

meanes the Queenes Maieſtie receyueth no ſmall benefite for this hir cuſtomes.&c. And furthermore, for that Nauigation is the chiefe force and ſtrength of our countrie, which whether it be true, I refer to the iudgement of all men, and although I be but ſimple (gentle Reader) and a great number of excellent learned men in the Mathematicall Science, haue written diuerſe bookes of Coſmographie and Nauigation, yet notwithſtanding I haue written this Regiment for the Sea, with a fewe rules of Nauigation, as it were a Noſegay, whoſe Floures are of myne owne gathering. And albeit the learned ſorte of Seafaring men haue no neede of this booke, yet am I aſſured that it is a neceſſary booke for the ſimpleſt ſorte of Seafaring men: for that they ſhall finde here the names of the circles in the ſphere, with the names of diuerſe things meete for Nauigation, togither with their vſes, which the moſt part of Sea men doo miſtake or miſſecal: neyther doo they knowe the vſe of them, being yet moſte neceſſary for them that vſe Nauigation in which alſo ther is a Table of Declination calculated for fower yeres, (that is to ſay, for the yeare of our Lord. 1573. the firſte after Biſſextilis, the yeare. 1574. being the ſecond yeare, and the yeare. 1575. which is the third yeare, with the yeare 1576. which is the yeare of Biſſextilis or leape yere it ſelf) which the Sea men doo call a Regiment, and wil ſerue for 24. yeare without any great errour: and is exactly calculated for the Longitude of London for the inſtant tyme of noone, and will ſerue all Europe and Affrica, neare vnto the coaſt of America, without much errour; ſauing in Februarie, March, or September, whileſt the Sunne hath ſwift declination. But in Iune and December it wil ſerue all the world ouer: bycauſe the Sunne hath but ſlow declination.&c. And alſo there be other neceſſary rules of Nauiga-

Nauigation, to know how to handle the Sunnes declination, to know the Altitude of eyther of the two Poles, (as the contentes of the booke doo shewe) with other necessary things meete to be knowne in Nauigation, and not mentioned in the booke of Martin Cursise, called the Art of Nauigation. Neyther doo I meane to write any thing mẽtioned in that booke: for that it is there sufficiẽtly declared alredy. And thus (gentle Readers) I desyre you to beare with my rudenesse, that I should take vpon me to open any science, for that I am vtterly vnlearned, and without help of any learned persons, desiryng you not to conceiue any euil opiniõ of me, but to take it as my good will, mynding to profite my natiue Country as much as lyeth in me. Notwithstanding it is possible that some people will be offended with me, that I should write this simple Treatise, but then I consider agayne, and knowe, that vertue lacketh no enemies & defacers, and vyce lacketh no friendes and maynteyners, so that knowledge lacketh no contempt, neyther ignorance lacketh furtherance; and especially among al people there is none more ready to contemne, than the ignorant sort: for ignoraunce is the father of al errours, and the mother of contention.

And thus I drawe to ende, desiring you to take this simple woorke in good parte, being willing to pleasure my natiue Country, according to the simple talent that God hath giuen me. And wheras you find any errour, I pray you let me gently vnderstand, for I thinke not that I cã so circumspectly work, but I may be deceyued, for man cannot be so precise but he may erre, and I haue seldome heard of any the best Authors, but he hath erred in some poynt: therfore in those things that he knoweth not of himselfe, he must needes followe his Author, and if his

Author

Author doo erre, he muſt needes fall into the ſame errour that his Author dooth. And furthermore, a number of people there be that deuiſe nothing elſe but lyes & ſlaunders, yea, & thoſe which cannot atteyne to any thing thẽſelues, doo hate all thoſe that be not ignorant as they thẽſelues be: for the corrupt nature of man is ſuch, that it is a corſey to their harts that any ſhould be cõmended before themſelues, for generally amongſt all people of the earth (which is innumerable) euery ſeueral perſon thinketh himſelfe moſt worthie, imagining themſelues to haue no fellowes: ſuch is the Diuell in the hart of man, pampering mans hart ſo with pride to thinke he hath no fellow, whereas man of himſelfe is not able to doo any good thing, no not to thinke one good thought, but by the only myght and prouidence of almyghty God, therfore of our ſelues we canne doo nothing that is good. And thus gentle Reader I make an ende. If this ſimple and barbarous thing be taken in good part, then looke for other of my workes ſhortly, & bere him good will that ſtudieth for the benefite of his natiue country, deſiring God of his grace, that I & you may do that thing that may be to the laude, prayſe, and glory of God, to our cõmoditie and ſoules health, to the profite of our brethren, and the common wealth of this our Realme.

Thus I betake you to almighty God the creator of all things, praying him that both I and you may after this life reſt in the kingdome of heauen with Abraham Iſaac and Iacob: there to remayn world without end.

Amen.

I. H.

I. H. in commendation of the Booke.

WHo ſo thou art that myndſt to paſſe the Seas,
By Compaſſe, Card, the Sunne, or ſtarry ſkie,
Marke wel this worke, and gain therby ſuch eaſe.
As ſhall attayne thee profit great perdie,
Such rules hath Bourne directed to thine eye,
That euen by them, if ſaylings art were gone,
Thou mightſt by t eſe direct thy courſe alone.

T. H. in prayſe of the Author.

WHo trauels Countries gayne, is worthy of great prayſe:
as thoſe that were before our time, & that in ſudry wayes.
Whoſe actes doo ſo excel, they pierce the loftie ſkies,
that in good artes for common weale, both wit and wil aplies.
For thoſe that were tofore, haue beene aduanſt by fame,
by due deſert, by doing well haue merited the ſame.
As Authors old can tell, who liſt in them to reade,
who were inuenters of the ſame which dayly now proceede.
In rule of publicke weale, our loue it firſt began,
and plaſt it here in all eſtates, for the beehoofe of man.
So now thou Seaman eke, that ſpreedſt abrod the ſayle,
be thankefull for thy Author here, which is for thy auayle.
Whoſe trauel and whoſe toyle is thy behoofe and gayne,
if thou doſt reape what he did ſow, it quiteth wel his paine.
And thankefulneſſe is due to euery liuing wight,
and dooth perteyne to euery man, but yet to God by right.
To whō be prayſe for euermore, which ruleth globe & ſphere,
who graunt vs grace to do his will, while we be liuing here.

FINIS.

B. A. R.

A. R. To the Author.

WHy doeſt thou Bourne thy ſelfe hold backe
not doing what thou ſhouldſt?
Me thinkes I heare thee Anſwere make
that if thou durſt thou wouldſt.
Whereof art thou afrayd? tell foorth
to me thy doubtfull caſe:
To vtter truth no man there is
that once will hide his face.
Perhaps thou feareſt the ſcoffing kinde
of Momus dearlings deare,
Perhaps againe, thou ſtandſt in doubt,
and art now daſht with feare.
To ſee theſe ſhaking quaking reedes
that bende with euery blaſt,
Looke frowning on this booke in which
great payne beſtowd thou haſt.
Why did not then Demoſthenes
his workes hide out of ſight?
Why did not Tullie ſtay his penne,
when he begæn to write?
If taunting tongue of Momus then
had bene ſo rife as now,
Thou thinkeſt perchance they would haue feard
the ſame as well as thou.
No ſure thou art deceyud: there were
as many light braynes then.
As there be now in theſe our dayes
to carpe at painfull penne.
But Countries profite lo it was
that cauſed them to write,
And prayſe of good men did prouoke
their workes to come to light.
And haſt not thou ſpent all the time
of writing this thy booke

FINIS.

For countries ſake, to profit all
that will vouchaſe to looke
Thereon? behold what prayſe here apt
that ſhip did firſt inuent.
It cannot be but they which reade,
perceyue ſhall thine intent.
Can any deeme amiſſe of thee
that vſe of ſhip haſt told,
When ſhips inuentor gayned hath
ſuch prayſes manifold?
Dooſt thou not know inuention
what of it may be thought,
When vſe and ſauegard of the ſame
there is none knoweth ought?
The Prouerb ſayth, a thing that is
too big to gripe in hand,
Cannot be holden lenger than
the ſieſe can hold the ſand.
In booke it cannot be denied
but thou haſt taken payne
To ſette forth playne the vſe of ſayle
for Countries common gayne.
Although I know how odious
compariſons be ſtill,
Be ſure examples take thou mayſt,
and vſe them at thy will
Sith therfore thou example haſt
of famous memory,
Demoſthenes *and* Tully *eke*
extold vnto the ſkie,
Wh⁹ excelling farre all other men
in Greeke and Latine phraſe
Were ſubiect yet to Sicophantes
and vnder Momus *blaſe.*

Thou haſt beſides all this, the truth
by practiſe truly tride:
Whereby if any kicke at thee,
they may be ſoone eſpide.
Of good men I dare boldly ſaye,
that good will thou ſhalt haue,
For euill of thee they none will ſpeake,
and prayſe thou doeſt not craue,
Therefore I wiſhe thee naught too feare,
the force that tongues can bende
But ſtill the worke thou haſt begonne
to bryng to perfect ende.

FINIS.

			Ianuary hath.xxxi.dayes
3	1	a	*New yeres day.*
	2	b	Octa. Stepha.
11	3	c	Octa. Iohn.
	4	d	Octa Iuno.
19	5	e	Thelosopho.hi.
8	6	F	*Twelfth day.*
	7	g	Iulian mart.
16	8	a	Seuerine bish.
5	9	b	Martian Virg.
	10	c	Paule first her.
13	11	d	*Sun in Aquari.*
2	12	e	Satire Mar.
	13	F	Oct. Epiphani.
10	14	g	Isidore martyr.
	15	a	Maurice.
18	16	b	Anthonie Abbot
7	17	c	Marcelle bish.
	18	d	Prisce bish.
15	19	e	Mari and his fel.
4	20	F	Fabian and Sa.
	21	g	Agnus virg.
12	22	a	Vincent mar.
1	23	b	Emerice.
	24	c	Timothie disci.
9	25	d	*Con. of Paule.*
	26	e	Policarp. mart.
17	27	F	Chrysost. Doct.
6	28	g	Theodore.
	29	a	Valerie bish.
14	30	b	Tran. S. Mark.
3	31	c	Ciri. and Jan.

			Februar hath. xxviii. dayes and In the yere of Bissixtilis, xxix. dayes.
	1	d	Brigit. Fast.
11	2	e	*Purific. of Mary.*
19	3	F	Blase mart.
8	4	g	Gilbert confes.
	5	a	Agathe virgin.
16	6	b	Dorothe virgin.
5	7	c	Amandus bish.
	8	d	Salomon.
13	9	e	*Sun in Pisces.*
2	10	F	Sother bishop.
	11	g	
10	12	a	Eufrase virgin.
	13	b	Valentine bishop.
18	14	c	Faustine bishop.
7	15	d	Julian virg.
	16	e	Constance virgin.
15	17	F	Simeon martyr.
4	18	g	Gabine Priest.
	19	a	
12	20	b	60. Martyres.
1	21	c	70. Martyres.
	22	d	Peters chayre.
9	23	e	Sirener. Fast.
	24	F	*Mathie Apostle.*
17	25	g	Policar. bishop.
6	26	a	Victor and his fel.
	27	b	Augustine bishop.
14	28	c	Oswald bishop.

March hath. xxxi. dayes.			
3	1	d	Dauid bishop.
	2	e	Basilic mart.
11	3	f	Maxime mart.
	4	g	Lucius mart.
19	5	a	Focius mart.
8	6	b	Uict. and Uenin.
	7	c	Tho. de Aquin.
16	8	d	Apoline mart.
5	9	e	40. Martyres.
	10	f	Gregorie bishop.
13	11	g	*Sun in Aries.*
2	12	a	Zacharie bish.
	13	b	Longine mart.
10	14	c	Patricius bish.
	15	d	Gertrude vir.
18	16	e	Anselme.
7	17	f	Edward king.
	18	g	Joseph, spon.
15	19	a	Cutbert bishop.
4	20	b	Benedict Ab.
	21	c	Affrodose bishop.
12	22	d	Pigment bish.
1	23	e	Theodore.
	24	f	Fast.
9	25	g	*Annun of Mary.*
	26	a	Castore mart.
17	27	b	John Heremy.
6	28	c	Dorothe mart.
	29	d	Eustace.
14	30	e	Sabine vir.
3	31	f	Balbine vir.

April hath. xxx. dayes.			
	1	g	Theodore virg.
11	2	a	Mary Egypti.
19	3	b	Richarde bish.
8	4	c	Ambrose bish.
	5	d	Marci and Ma.
16	6	e	Sextus mart.
5	7	f	Euphemi vir.
	8	g	Denise mart.
13	9	a	Perpetuus bish.
2	10	b	Marcus mart.
	11	c	*Sun in Taurus.*
10	12	d	Appoline mart.
	13	e	Sother martyr.
18	14	f	Tyburt mart.
7	15	g	Osmond bishop.
	16	a	Isidore bishop.
15	17	b	Anicete bishop.
4	18	c	Eluther bishop.
	19	d	Tiburtius con.
12	20	e	Hermogenes.
1	21	f	Quintine.
	22	g	Clete bishop.
9	23	a	Gorge mart.
	24	b	Wilfride con.
17	25	c	*Marke Euan.*
6	26	d	Anastace bish.
	27	e	Vitalis mart.
14	28	f	Peter of Mi.
3	29	g	Clete bishop.
	30	a	Dep of Erken.

			May hath xxxi. dayes.
11	1	b	*Philip and Iacob.*
	2	c	Athanasius bish.
19	3	d	Inuen. of the crosse.
8	4	e	Christopher.
	5	F	S. Augustine.
16	6	g	John port lat.
5	7	a	John of Beuer.
	8	b	Appe. of Mich.
13	9	c	Transl. of Nic.
2	10	d	Gordiane.
	11	e	*Sun in Gemini.*
10	12	F	Nereus & Achileus mart.
	13	g	Seruacius conf.
18	14	a	Bonifacemart.
7	15	b	Sophia virgin.
	16	c	Brandon Bishop.
15	17	d	Transl of Bar.
4	18	e	Dioscor. mart.
	19	F	
12	20	g	Dunstan con.
1	21	a	Barnardine.
	22	b	Helene queene.
9	23	c	Petronill.
	24	d	Iulian virg.
17	25	e	Desiderie mart.
6	26	F	Adelme conf.
	27	g	
14	28	a	Germaine bish.
3	29	b	Nicomede.
	30	c	Torme martyr.
11	31	d	Felix bishop.

			June hath xxx. dayes
	1	e	Nicodeme.
19	2	F	Erasmus.
8	3	g	Basill.
	4	a	Marcel. martyr.
16	5	b	Petrocius con.
5	6	c	Bonface bish.
	7	d	Medard and Gil.
13	8	e	Transl. Edmond.
2	9	F	Yuan conf.
	10	g	Tran. of Wol.
10	11	a	Barnabe App.
	12	b	*Sun in Taurus.*
18	13	c	Anthony conf.
7	14	d	Basilides conf.
	15	e	Vite modeste.
15	16	F	Transl. Richar.
4	17	g	Botulphe conf.
	18	a	Eruperie bish.
12	19	b	Gerualius mar.
1	20	c	Transl. Edwar.
	21	d	Walburge virg.
9	22	e	Albane mart.
	23	F	Fast.
17	24	g	*Iohn Baptist.*
6	25	a	Transl. of Elig.
	26	b	John and Pa.
14	27	c	Crescens mart.
3	28	d	Fast.
	29	e	*Peter and Paule.*
11	30	F	

July hath. xxxi. dayes.				August hath. xxxi. dayes.			
19	1	g	Octa. John Bap.	8	1	c	Lammas.
8	2	a	Visit. of Mary.	16	2	d	Steuen Bishop.
	3	b	Gregorie bishop.	5	3	e	Finding of Ste.
16	4	c	Domitius mart.		4	F	Iustine Priest.
5	5	d	Parthene con.	13	5	g	Festum niuis.
	6	e	Procope mart.	2	6	a	Transl. domi.
13	7	F	Zenone mart.		7	b	Feast of Iesu.
2	8	g	Paternian Bish.	10	8	c	Cirack and his fel.
	9	a	Pius bish.		9	d	Roman mart.
10	10	b	*Dog dayes be.*	18	10	e	Laurence mart.
	11	c	Hermaco. for.	7	11	F	Tiburt and Su.
18	12	d	Anaclete. bishop.		12	g	Clare virgin.
7	13	e	Quirine and Iu	15	13	a	Ypolite virgin.
	14	F	*Sun in Leo.*	4	14	b	*Sun in Virgo.*
15	15	g	Marine Vir.		15	c	Assump. of Mary.
4	16	a	Symph. cum. 7.	12	16	d	Roche confess.
	17	b	Arlene berem.	1	17	e	Octa. Laurence.
12	18	c	Praxede vir.		18	F	Agapite mart.
1	19	d	Margar vir.	9	19	g	Lewes bishop.
	20	e	Praxede vir.		20	a	*Dog dayes end.*
9	21	F	Appoline bishop.	17	21	b	Anastase mart.
	22	g	Mary Magda.	6	22	c	Timo and Hip.
17	23	a	Christian.		23	d	Eleazor. Fast.
6	24	b	Fast.	14	24	e	*Barthol. Apostle.*
	25	c	*Iames Apostle.*	3	25	F	Lewes king.
14	26	d	Anne mo. of Ma.		26	g	Zepherine bish.
3	27	e	Panchalcon.	11	27	a	Rufus mar.
	28	F	Sampson bish.	19	28	b	Augustine bish.
11	29	g	Marie virgin.		29	c	Johns behead.
	30	a	Abbo and Sen.	8	30	d	Felix and Audact.
19	31	b	German bishop.		31	e	Cuthbur virg.

The Kalender.

September hath.xxx.dayes.				October hath.xxxi.dayes.			
16	1	F	Giles abbot.	16	1	a	Remigius bish.
5	2	g	Anthony mart.	5	2	b	Leodegar mar.
	3	a	Eupheme.	13	3	c	Candide mar.
13	4	b	Moyses pro.	2	4	d	Francis mar.
2	5	c	Venturine.		5	e	Fayth virgin.
	6	d	Zacharie pro.	10	6	F	Gerionis.
10	7	e	Enurce bishop.		7	g	Marce and Mar.
	8	F	Natiuitie of Ma.	18	8	a	Apolinaris mar.
18	9	g	Gorgone mart.	7	9	b	Pelagi virgin.
7	10	a	Nicholas de Tol.		10	c	Linus conf.
	11	b	Protece and Hi.	15	11	d	Denice & his fe.
15	12	c	Sire bishop.	4	12	e	Nichasius bish.
4	13	d	Philip bishop.		13	F	Wilfride bish.
	14	e	*Sun in Libra.*	12	14	g	*Sun in Scorpio.*
12	15	F	Nicomede priest.	1	15	a	Calixt bishop.
1	16	g	Edith virg.		16	b	Wolfran bish.
	17	a	Lambart bishop	9	17	c	Mich. of the mount.
9	18	b	Victor and Cor.		18	d	*Luke Euangelist.*
	19	c	Eustace.	17	19	e	Etheldred virg.
17	20	d	Fast.	6	20	F	Fridelwide vir.
6	21	e	*Mathew Apostle.*		21	g	Austrebert virg.
	22	F	Maurice.	14	22	a	vi. M. virgins.
14	23	g	Line mart.	3	23	b	Mary Salome.
3	24	a	German abbot.		24	c	Romaine bish.
	25	b	Cleophin and Ap.	11	25	d	Maglore bish.
11	26	c	Cipzian and Iu.		26	e	Crispi. and Cris.
19	27	d	Cosme and Da.	19	27	F	Fast.
	28	e	Exupere bishop.	8	28	g	*Simon and Iude.*
8	29	F	*Michael Arch.*		29	a	Narcissus bish.
	30	g	Hierome doct.	16	30	b	Germaine conf.
				5	31	c	Fast.

The Kalender.

			Nouember hath.xxx.dayes				December hath.xxxi.dayes.
	1	F	*All Saints.*		1	F	Elegi bishop.
13	2	g	All Soules.	13	2	g	Liban mart.
2	3	a	Wenefride virg.	2	3	a	Dep.of Osmo.
	4	b	Amantius.		4	b	Barbara virg.
10	5	c	Lete prest.	10	5	c	Sabba bishop.
	6	d	Leonard.		6	d	Nicholas bish.
18	7	e	Wilbrode.	18	7	e	Octa. Andrew.
7	8	F	Fower crownd.	7	8	F	Con.of Mary.
	9	g	Theodore.		9	g	Cyprian bish.
15	10	a	Martine.	15	10	a	Eulalie vir.
4	11	b	Martine bishop.	4	11	b	Antippe.
	12	c	Brise bishop.		12	c	Damase con.
12	13	d	*Sun in Sagit.*	12	13	d	*Sun in Capricor.*
1	14	e	Tran.Erkenw.	1	14	e	Nicasius vir.
	15	F	Macute bishop.		15	F	Otholie vir.
9	16	g	Dep.of Edmond.	9	16	g	O Sapientia.
	17	a	*Init reg.Eliza.*		17	a	Lazarus con.
17	18	b	Octa Martine.	17	18	b	Gracian bish.
6	19	c	Elizabeth mart.	6	19	c	Uenetia vir.
	20	d	Edmond king.		20	d	Fast.
14	21	e	Pres.of Mary.	14	21	e	*Thomas Apostle.*
3	22	F	Ciceli virgin.	3	22	F	xxx.Martyres.
	23	g	Clement mart.		23	g	Uictor virg.
11	24	a	Grisogon mart.	11	24	a	Fast.
19	25	b	Catharine virgin.		25	b	*Christmas day.*
	26	c	Line mart.	19	26	c	*Stephen mart.*
8	27	d	Uitales conf.	8	27	d	*John Euang.*
	28	e	Rufus mart.		28	e	*Innocentes day.*
16	29	F	Saturni. Fast	16	29	F	
5	30	g	*Andrew Apostle*	5	30	g	Tran.of James.
				13	31	a	Siluester mart.

A Table or Kalender for 30. yeares, shewing the Prime, the Sundayes letter, and Leape yeare, and the mouable Feastes, as the first Sunday in Lent, and Easter day, Ascention day, and Whitsonday.

The yere of our Lord.	The Prime	Dominicall Letter.	First Sunday in Lent.	Easter day.	Ascention day.	Whitsonday.
1574	17	c	28. Febru.	11. Aprill	20. May	30. May
1575	18	b	20. Febru	3. Aprill	12. May	22. May
1576	19	ag	11. March	22 Aprill	31. May	10. June
1577	1	f	24. Febru	7. Aprill.	16. May	26. May
1578	2	e	16. Febru.	30. Mar.	8. May	18. May
1579	3	d	8. March.	19. Aprill	28. May	7. June
1580	4	cb	20. Febru	3. Aprill	12. May	22. May
1581	5	a	12. Febru	26. Mar.	4. May	14. May
1582	6	g	4. March.	15. Aprill	24. May	3. June
1583	7	f	17. Febru.	31. Mar.	9. May	19. May
1584	8	ed	8. March.	19. Aprill	28. May	7. June
1585	9	c	28 Febru	11. Aprill	20. May	30. May
1586	10	b	20. Febru	3. Aprill	12. May	22. May
1587	11	a	5. March.	16. Aprill	25. May	4. June
1588	12	gf	24. Febru.	7. Aprill	16. May	26. May
1589	13	e	16. Febru	30. Mar.	8. May	18. May
1590	14	d	8. March	19. Aprill	28. May	7. June
1591	15	c	21. Febru	4. Aprill	13. May	23. May
1592	16	ba	12. Febru.	26. Mar.	4. May	14. May
1593	17	g	4. March.	15. Aprill	24. May	3. June
1594	18	f	17. Febru.	31. Mar.	9. May	19. May
1595	19	e	9. March.	20. Aprill	29. May	8. June
1596	1	dc	28. Febru.	11. Aprill	20. May	30. May
1597	2	b	13 Febru.	27. Mar.	4. May	15. May
1598	3	a	5. March	16. Aprill	25. May	4. June
1599	4	g	25. Febru.	8. Aprill	17. May	27. May
1600	5	fe	9. Febrna.	23. Mar.	1. May	11. May
1601	6	d	1. March.	12. Aprill	21. May	31. May
1602	7	c	21. Febru.	4. Aprill	13. May	23. May
1603	8	b	13. March	24. Aprill	2. June.	12. June

For that the common people doo fal into such a number of errours as touching the length of the day, holding an opinion, that in euery fifteene dayes the day is an houre longer or shorter, the truth is this: the day dooth keepe no such proportion in the lengthening and shortning, but doth length and shorte according vnto the swiftenesse and slownesse of the Sunnes declination, for when the Sunne hath swift declination, then dooth the day lengthen and shorten apace: and when that the Declination is slow, then doth the day lengthen or shorten but slowly. And yet the most parte of the common people doo holde an opinion, that at Christmasse or else at New yeares day at the furthest, the day must needs be an houre longer, and yet the Sunne hath not declined or come towardes the Equinoctiall two degrees and a halfe, which will not make halfe an houre in the length of the day. Wherefore I do thinke it good to declare thorowe the whole yeare, when the day is an houre longer or shorter heere in this place for the Latitude or heigth of the Pole Artick at London, the Pole being rayled fifty one degrees thirty two minutes, or thirty foure minutes: and our longest Sommer day is sixteene houres and a halfe, and our shortest Winter day is seuen houres and a halfe from the rysing of the Sunne vnto the setting of the Sunne: and first this, the shortest Winter day is the leuenth or twelfth day of December, and then the Sunne ryseth a quarter of an houre after eyght, and setteth a quarter of an houre before foure of the clocke, and then the Sunne hath his greatest declination vnto the Southwardes. And then the twentynine day of December the day is a quarter of an houre longer, then ryseth the Sunne at eyght of the clocke, and settes at foure. And then the seuenteene or eyghteene of January the day is an houre longer, and not before, for the Sunne must be declined from his Solstick of winter, fiue degrees and twelue minutes before the day is lengthened an houre, so that I doo affirme, that from the fourth or fifte day of November, vnto the seuenteen or eyghteene day of January, in all that time the

day

day is but one houre shorter and longer, which is the time of tenne weekes. And then the twenty seuen or twenty eyght of Januarye the night is fifteene houres long, then ryseth the Sunne halfe an houre after seuen, and setteth halfe an houre after foure of the clocke. And then the leuenth or twelfth day of Febzuary the day is tenne houres long, then ryseth the Sunne at seuen, and setteth at fiue of the clocke. And then the twenty sixe day of Febzuary the day is a leuen houres long, then ryseth the Sunne halfe an houre after sixe, and setteth halfe an houre after fiue of the clocke. And then the leuenth day of Marche the Sunne is vpon the Equinoctiall, and the day iust twelue houres long all the wozlde ouer. And then the twenty foure day of March the day is thirteene houres long, and then ryseth the Sunne halfe an houre before sixe, and setteth halfe an houre after sixe of the clocke. And then the seuenth day of Apzill the day is fourteene houres long, and then ryseth the Sunne at fiue of the clocke iust, and setteth at seuen of the clocke iust. And then the twenty three day of Apzill the day is fifteene houres long, and there ryseth the Sunne halfe an houre before fiue, and setteth halfe an houre after seuen of the clocke. And then the fifteene day of Maye the day is sixteen houres long, then ryseth the Sunne at foure of the clock, and setteth at eyght of the clocke iust. And then the leuenth of June the Sunne hath his greatest declination to the Northwarde, and then is our longest Sommer dayes, and then it is sixteene houres and a halfe, from the Sunne ryssing vnto the Sunne setting, so that the Sunne ryseth a quarter of an houre before foure, and setteth a quarter of an houre after eyght of the clocke. And then the tenth day of July the day is sixteene houres long, then ryseth the Sunne at foure, and setteth at eyght of the clocke. And then the last of July the day is fifteene houres long. And then the sixteene day of August the day is fourteene houres long. And then the laste day of August the day is thirteene houres long. And then the thirteene or fourteene of September the Sunne is vpon the

Equinoctiall, and the day iust twelue houres long. And then the seuen and twentye daye of September the day is eleuen houres long. And then the eleuenth day of October the day is ten houres long. And then the sixe and twenty day of October the day is nyne houres long. And then the fifteene day of Nouember the day is eight houres long: and so vnto the eleuenth or twelfth day of December, and then the day is at the shortest (as before is declared.)

Thus much haue I said as touching the length of the day by euen houres, which some people wyll haue at the entrance of the Sunne into the twelue Signes, of which in the lengthnyng and shortnyng of the day there is no such matter, but only this: Looke when that the Sunne hath declined fiue degrees and twelue minutes in this our latitude, then is the day an houre longer or shorter, as you shal finde this matter more largelier spoken of in all places through the world, in the eleuenth Chapter of the Booke.

Faultes escaped in the printing.

Fol.12.b.lin.20. for rarer, reade rather. Fol.35.b.lin.11 and.12. for Vacula, reade Bacula. Fol.38.a.lin.26. for.96. reade.86. Fol.45.a.lin.20. for noone, reade Rome. Fol.eod. lin.24. for a quarter, reade three quarters. Fol.46.a.lin.13. for 52. reade.53. Fol.eod.line.15. for.15. reade.17. Fol.47.a.lin. 30. for treating, reade trenting. Fol.48.a.lin.24. for whole, reade holde. Fol.eod.b.lin.3. for myddle of the line, reade myddlemost lyne.

¶ A Table of the reigne of Kinges since the Conquest.

Number of Kyngs and Queenes.	The names of the kings of England.	Beginnyng of their Reigne.	Tyme of their death.	The place of their buryall.
1	Willia Conqueroz	14. Oct.	9. Sept. 1087	Cane in Noym.
2	William Rufus.	9. Sept.	1. Augu. 1100	Westminster.
3	Henry the first.	1. Aug.	2. Dece. 1136	Redyng.
4	Stephan.	2. Dece	25. Octo. 1154	Feuersham.
5	Henry the second.	25. Oct.	6. July. 1189	Fonteuerard.
6	Richard the first.	6. July.	6. Aprill. 1199	Fonteuerard.
7	John.	6. April	19. Octo. 1216	Worcester.
8	Henry the thyrd.	19. Oct.	16. Nou. 1272	Westminster.
9	Edward the first.	16. No.	6. July. 1307	Westminster.
10	Edward the second	6. July.	25. Janu. 1327	Glocester.
11	Edward the thyrd.	25. Jan	21. June. 1377	Westminster.
12	Richard the second	21. Jun.	16. Sep. 1400	Westminster.
13	Henry the fourth.	16. Sep	20. Mar. 1413	Canterbury.
14	Henry the fifth.	20. mar	31. Aug. 1422	Westminster.
15	Henry the sixt.	31. Aug	4. Mar. 1461	Windsore.
16	Edward the fourth	4. Mar.	9. April. 1483	Windsore.
17	Edward the fifth.	9. April.	22. Jun. 1484	Westminster.
18	Richard the third.	22. Jun	22. Aug. 1486	Leycester.
19	Henry the seuenth.	22. Aug	22. Apri. 1509	Westminster.
20	Henry the eyght.	22. Apr	28. Janu. 1547	Windsore.
21	Edward the sixt.	28. Jan.	6. July. 1553	Westminster.
22	Queene Mary.	6. July.	17. Nou. 1559	Westminster.
23	Queene Elizabeth	17. No.		

¶ Apro-

A profitable and necessary Rule to knowe the begynnyng and endyng of euerye *Terme, with their Returnes.*

Hillarie Terme begynneth the. xxiii. of January, if it be not Sunday, which then is referred vntyll the next day after, and endeth the. xii. of Febyuary, and hath foure Returnes, that is to say:

Octauis Hilarij. } { *Crastino Purific.*
Quind. Hilarij. } { *Octauis Purific.*

Easter Terme begynneth. xvii. dayes after Easter, and endeth the Monday next after the Ascension day, and hath fiue Returnes, that is to say:

Quind. Pasch. { } *Mense* } *Quinque Pasche.*
Tres Pasche. { } *Pasche.* } *Crast. Ascension.*

Trinitie Terme begynneth the Fryday next after Trinitie Sunday, and endeth the wednesday fortnight after, & hath foure Returnes, that is to say:

Crast. Trinitatis. { } *Quind. Trinitatis.*
Octauis Trinita. { } *Tres Trinitatis.*

Michaelmas Terme begynneth the. ix. day of October, if it be not Sunday, and endeth the. xxviii. or. xxix. of Nouember, and hath eight Returnes, that is to say:

Octauis Michael. } { *Crast. Animarum.*
Quind. Michael. } { *Crast. Martini.*
Tres Michaelis. } { *Octa. Martini.*
Mense Michael. } { *Quind. Martini.*

Note also that the Exchequer openeth eight dayes before any Terme begyn, except *Trinitie Terme*, which openeth but foure dayes before.

Thyrtie dayes hath September: Aprill, Iune, and Nouember.
February hath. xxviij. alone: and all the rest thirty and one
Except the leape yeare, wherin Febyuary hath. xxix.

¶ An

¶ *An Introduction vnto the Regiment for the Sea*

The names of certaine things necessary to be knowne of them that are Mariners or Seafaring men, meete to be knowne of them that doo practise Navigation, as this: the names of the circles of the Sphere, and what they are, and their vses: and also the names of other things belonging thereunto, and what they are, and their vses.

First, what the Horizon circle is.

THe Horizon is the parting of the earth, or the Sea, and the skye, that is to say, the halfe of the heauens being aboue ouer your heade, and the other halfe hidden with the earth or Sea vnder them: and this Horizon circle doth moue as you doo moue: for as you doo by trauell change your place, so doth the Horizon chaunge in al points.

The vse of the Horizon circle.

THe vse of the Horizon circle is this, to take the heigth of the Sunne or any starre, with the crosse staffe, setting the one ende with the Horizon, and the other ende with the Sunne or starre, so that you haue a true Horizon: and that must be doone vpon the Sea, or else it must be a very playne grounde vpon the toppe of a hill, else it is no true Horizon. And also if the Sun or Moone, or any starre be to be seen, thē they be aboue the Horizon: if they be not seene, then they be vnder the Horizon.

2. *What the Merian circle is.*

THe Meridian is a circle beginning due South, and so passing by your Zenith, that is right ouer the crowne

of your head, and so by the two Poles of the world: and if you doo trauell due South and North, you doo not chaunge your Meridian: but in the going or trauelling any other way, you doo chaung it.

¶ *The vse of the Meridian circle.*

The vse of the Meridian circle is, to know the iust time of noone by the Sunne: for as soone as the middle of the Sun is vpon the Meridian, then it is noone, and when the Sunne, Moone, or any Starre is vpon the Meridian, then they be farthest from the Horizon, and it is a meete tyme to take their heygth for to knowe the Altitude or heygth of the Pole of the world, whereby you may perfitly knowe, howe farre you bee too the Southwardes or Northwardes of any place.

3. *What the Equinoctiall circle is, being a Paralell lyne, or circle fixed.*

The equinoctial is a fired circle in the heauens, equally distant from both the Poles, and dooth passe directly ouer the middle of the earth round about, and is called the Equinoctiall, for that if the Sunne be there, then showeth all the whole world the Sunne is twelue houres aboue the Horizon, and twelue houres vnder the Horizon, sauing vnder the two poles, and there the Equinoctiall is with the Horizon. So they shall see halfe the Sunne and no more, till the Sunne be departed from the Equinoctiall. And also too them that doo inhabite or dwell in any place vnder the Equinoctiall, the Sunne, Moone, and all the Starres be twelue houres aboue the Horizon, and twelue houres vnder the Horizon.

¶ *The vse of the Equinoctiall circle.*

The vse of the equinoctial, is to know what declination the Sunne or any other Starre hath from it, and of whiche side, and by that is known the heigth of the Equinoctiall,

and

and by the heigth of that is known the heigth of either of the two Poles of the world.

4. What the circle or Tropick of Cancer is, being a Paralell circle fixed.

The tropicke of Cancer, is the greatest declination that the Sunne dooth come vnto the Northwardes, and then is our longest Sommer dayes, and shortest nyghts.

5. What the circle or Tropick of Capricorne is, being a Paralell circle fixed.

The tropicke of Capricorne, is the greatest declination that the sunne dooth go vnto the Southwardes, and then is our shortest Winter dayes, and longest nights.

The vses of these two circles be but smal, but that the dayes being at the longest or shortest, the Sunne doth returne backe againe, &c.

6. What the Articke circle is, beeing a Paralell circle.

The Articke circle doth touch the Horizon due North, and is according to the place that you are in, of any place vpon the face of the earth, and dooth wyden and narrowe according vnto the altitude or heigth of the Pole: for as you doo goe vnto the South partes, then doth your Articke circle growe narrower and narrower, vntill you come ryght vnder the Equinoctiall line, and then haue you no Articke circle: and if that you do go vnto the North partes, then doth your Articke circle growe wider and wider: and where the North Pole is raised. 66. degrees and a half, there the Artick circle is iuft with the Tropick of Cancer, and then vnder the north Pole, there your Artick circle is with the Equinoctial.

¶ The vse of the Articke circle.

The vse of the Artick circle, is to know what Starres doo neuer set vntoo you, for all those Starres or lyghtes that you doo see vnder the Pole, doo not set: and if that you bee vnto the Northwardes, of the heigth of the Pole, more

than.66.degrees and a halfe: if that the Sunne or Moone be in the Tropick of Cancer, they shall not goe downe vnto you vnder the Horizon, but shall be still in sighte vnto you, so that they be not let by the cloudes and other accidentes.

7. *What the Antarticke circle is, being a Paralel circle.*

THe Antarticke circle doth touch the Horizon due South, and is opposite or right agaynst the Articke circle, and doth wyde and narrowe in all poyntes, and doth not differ from the Articke circle, sauing the Artick circle is aboue the Horizon, and the Antarticke circle is vnderneath the Horizon.

The vse of the Antarticke circle.

THe vse of the Autarticke circle, is as the Articke is, in all poyntes, to knowe what starres will not appeare aboue your Horizon, and in lyke manner, to the Northwardes of 66.degrees and a halfe, (the Sunne or Moone being in the Tropicke of Capricorne) then they will not ryse aboue the Horizon.

8. *What the Zodiacke is, being a circle.*

THe Zodiacke is the greatest circle in all the Heauens, wherein all the wandering lyghtes or Planets doo keepe their courses, that is to say, the Sunne and Moone, and the other fiue Planets or Starres, that is to say, *Saturne, Iupiter, Mars, Venus, & Mercurie. &c.* which Circle is diuided into twelue equall partes, called the twelue Signes, as *Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces,* the which Circle standeth oblique or awry crossing the Equinoctial in the myddle at two places: the Northermost part is the myddle of the Zodiacke, and that is the Tropicke of Cancer: and the Southermost

most part is the Tropicke of Capzicozne, the very myddle of the Zodiacke: and that lyne in the myddle of the Zodiacke is called the Eclipticke lyne, and the Zodiacke is. 12. degrees bzoade, that is to say, sixe degrees from the Eclipticke lyne vnto the Nozth parts, & sixe degrees vnto the South parts.

¶ The vse of the Zodiacke.

The vse of the Zodiacke is, thzough the mouyng of the Sunne and Moone and the other Planets, to knowe in what Signe they be, and also to knowe the tyme of the chaunge of the Moone, with all the other aspectes: and in like maner to know the aspects of al the other planets vnto the Moone, and also the planets amongst themselues: and by the aspectes in the. 12. signes is gathered their effects, and in what countrey it may happen.

9. What the line Ecliptick is.

The line Eclipticke, is a circle in the very middle of the Zodiack, the which, the very middle oz center of the Sun doth go vpon.

The vse of the line Ecliptick.

The vse of the line Ecliptick is this, if that the Moone oz any other starre, be vnto the Nozth part therof, then it is sayd, that they haue Nozth Latitude, and if vnto the Southe part, then they haue south latitude: and also by this circle called the line Ecliptick, is knowne the Eclipse of the Sunne and the Moone.

10. What the artick polar circle is, being a paralell circle fixed.

The articke polare cirlce is made by the pole of the Zodiack, oz pole of the circle ecliptick. 23. degrees and a halfe in the heauens from the poles of the wozld aboue the horizon.

11. What the Antartick Polar circle is, being a Paralell circle fixed.

The antarticke polar circle is iust oppoſite vnto the artick polar, made by the antartick pole vnderneath our Horizon. The vſe of them I will declare, when I ſpeake of the poles of the Ecliptick or Zodiack.

12. What the two circles called Colures be. &c.

The.2. circles called Colures, be thoſe that do deuide the Zodiack, and all the other paralell circles into.4. equal parts, the one of the circles doth croſſe the Zodiack in the firſt poynt of Aries and Libra, and ſo paſſeth by the two Poles of the world, and is called the Equinoctiall Colure: and the other Colure circle doth croſſe the Zodiacke in the firſte poynte of Cancer and Capricorne, and ſo paſſeth the.2. Poles of the world, and there at the.2. poles the one circle dooth croſſe the other: and that is called the Solſticial colure.

¶ The vſe of theſe two circles.

The vſe of the.2. colure circles is this, the Sun paſſing by them, dooth deuide the yeare into.4. partes: as this, the Sunne in the firſt poynt of Aries, is ſpring time. &c.

13. What the.2. Poles of the world is, imagined to be as an axiltree.

The.2. poles of the world, imagined to be as an axiltree, (that is to ſey, the North Pole called the Pole Artick, and the South pole called the pole antartick) the one is directly againſt the other: the North pole alwayes aboue our horizon, and the South pole antartick alwayes vnder our horizon, being fixed faſt in the heauens, and the equinoctiall iuſt and equally betweene them: and the cauſe why that it is imagined too bee an Axiltree is this, for that the whole heauens and all the lyghtes of the Firmamente bee caryed rounde aboute from the Eaſt vntoo the Weaſte in fowre and twenty houres:

so that no lyght nor place remayneth vnremoued, but onely the.2. Poles of the world.

¶ *The vse of the Poles of the world.*

The vse of the.2. Poles, is this, to knowe how farre we doo transporte our selues, and to know what climate, and temperatenesse we be in, as touching heate and colde.

14. What the.2. Poles of the Zodiack is, imagined to be an axiltree in the heauens.

The.2. Poles of the Zodiack, or Ecliptick, imagined to be as an axiltree, (the artick pole of the Zodiack, or rather the Ecliptick, and the Antarticke Pole of the Zodiack) the one being directly againste the other, and the Zodiack or rather the middle thereof, called the ecliptick, to be iuste or equall betweene them, are called the Poles of the Zodiacke: for that the Sunne and the Moone, and the other Planets and fixed starres doo moue vnto the Eastwarde, according to the standing of the Zodiacke. &c.

¶ *The vse of the Poles of the Zodiack.*

The vse of the two Poles of the Zodiack is this, (as it is before declared) that the Zodiack is deuided into.12. equall partes, called the.12. signes, and those diuisions by imagination do passe vnto the Poles of the Zodiack, in such forme as the Meridian lines doo all meete at the poles of the world, and so doo all those diuisions meete at the two poles of the Zodiack, and then any starre, that is out of the Zodiack, eyther vnto the Southwardes, or Northwardes, (according vnto those diuisions) they be called in the singes.

15. What the Zenith or verticall point is, imagined to be as an axiltree.

The

The Zehich or vertical point, is imagined to be a pyck in the heauens right ouer the crowne of your heade, and is moueable as we our selues be, for is as an axiltree vnto the horizon circle: and as you doo transporte your selfe from one place vnto an other, so dooth your Zenith or verticall poynte, and your horizon circle also.

The vse of the Zenith or verticall poynt. &c.

The vse of the zenith or verticall point is this, to know howe neare or howe farre off any starre is from your Zenith, by taking the true heigth of any starre with an instrument, for that from your Zenith, is alwayes. 90. degrees downe vnto the Horizon on euery side round about you, as it shall more plainely appeare hereafter, where I speake of degrees.

16. What a degree is.

A Degree is the part or deuision of a whole circle, into 360. equall parts, how big or smal soeuer the circle be.

The vse of the degrees is manifold.

The vse of the degrees is to knowe by the Sunne and Moones course in the Zodiacke, or any other of the Planets or mouable starres, how many degrees they be asunder: wherby is knowne at what tyme they haue any aspecte the one with the other. And also by the degrees it is knowne, what latitude and what declination any lyght or starre hath from the Ecliptick or Equinoctial: and also the degrees will shewe vnto you howe many miles that you doo transporte your selfe vpon the earth to the South or North partes, for that euery Degree doth aunsweare vntoo. 60. Englishe Myles, in the going South and North: which is knowne by the altitude of the North pole, or the number of degrees betweene the equinoctiall and youre Zenith or verticall poynt, for from your Zenith vnto the horizon, is. 90. degres to the Southwardes, and 90. degrees vnto the Northwardes, which is halfe the com-

passe

passe of the heauens for twice. 90. is. 180. and then the earth doth hide the other halfe of the heauens: and twice. 180. maketh. 360. the whole contemes of the compasse of euery greate circle in the heauens.

17. What a Minute is.

Of minuts there be two sortes, minuts of time, and minutes of measure, and is no other thing but the lesser parte of time or measure, which is the. 60. parte of a degree, or the. 60. parte of an houre: and all the diuisions in these matters, is by. 60. For as. 60. Minutes is a degree or an houre, so. 60. seconds is a Minute, and. 60. thirdes is a seconde, and. 60. fourthes is a third, &c.

18. Altitude is heigthe: the vse thereof.

Altitude is the heigth of any thing taken, as the heigth of the Sunne or any Starre, or the heigth of the Pole, aboue the Horizon: or the heigth of a Steeple, or tower, or such other lyke.

19. Latitude is wideneſſe: the vſe therof.

Latitude is in the heauens: if the Moone, or any other Starre be vntoo the South partes or the North partes of the Ecliptick, that then it is sayde, to be so many degrees in latitude or wideneſſe, from the line Ecliptick to the South or North parte: and also Latitude is counted vpon the Earth in in like maner, if that you be in any place betweene, from vnder the equinoctiall, eyther to the South or North part, betweene any of the. 2. Poles, that you are so many degrees in Latitude from the Equinoctiall. &c.

20. Longitude is length: the vse therof.

Longitude in the heauens is, if the Sun or Moone or any other Starre, be in such a signe, and so many degrees: that then it is sayd: that they haue longitude, in such a signe and so

many degrees. And also longitude vpon the earth, is counted from the Canary Ilands vnto the Eastward, as this, if that any towne or Citie be vnto the Eastwardes so many degrees from the Canary Ilands, then it is sayde, that the Citie or towne is so many degrees in Longitude, whereby is knowne the time of the chaunges of the Moone, or any other aspecte, or anye Eclipse of the Sunne or Moone, at the Citie or towne.

21. Declination is leaning: the vse thereof

DEclination is counted in the heauens, if that the Sunne or any other Starre be vnto the North part, or Southe part of the equinoctiall, then it is sayde, that the Sunne or Starre hath so many degrees of declination to the South, or to the North parts, as it happeneth. &c.

22. Circumference is the compasse of a circle by the outer edge.

Diameter is the breadth of a circle, passing ryght ouer the center or middle thereof, from outside vnto outside.

23. Center is the middle prick in any circle, equally distant from the edge of the circle in euery place.

A paralel line or circle is, if two lines or more (how many soeuer there be) be equally distant in euery place alyke, being ryght lines.

24. Auge what it is.

Auge is a point in the heauens, whe the Sun or Moone is exentrick, going neerer vnto the heauens, and further from the earth than his common order is: and the oppolition thereof is, when that the Sunne and Moone doo come nearer vnto the earth than they doo at any other time.

The vse thereof.

The vse thereof is, to knowe when that they be in their swifte motion, or in their slow motion: in the pointe of Auge, they be in their slow motion, in the oppolition thereof in theyr swifte motion.

25. What the head or tayle of the Dragon is.

The head of the Dragō is the place where that the Moone dooth come ouer the line Ecliptick, from the South part, vnto the North part: and the tayle of the Dragon is, where the Moone passeth ouer the line ecliptick, from the Northe part, vnto the South part.

The vse of the head and tayle of the Dragon.

The vse of the head and taile of the Dragon, is to know, when that there is any Eclipse of the Sunne or Moone: and of what quantitie or greatnesse the Eclipse is.

26. What Navigation is.

Navigation is this, how to direct his course in the Sea, to any place assigned, and to consider in that direction what things may stande with him, and what things may stande agaynst him, hauing consideration how to preserue the shippe in all stormes and chaunges of weather that may happen by the way, to bring the ship safe vnto the port assigned, and in the shortest time.

The vse of Navigation.

The vse thereof is this, fyrste too knowe howe that the place dooth beare from him, by what wynde or poynte of the compasse, and also how farre that the place is from hym, and also to consider the streame, or tide gates, Currents, whiche waye that they doo serue or drine the shippe, and also too consider what daungers is by the waye, as Rockes and sandes, and such other like impediments, and also if that the wynde chaunge or shifte by the waye, to consider which

way to stande, and direct his course vnto the most aduantage, to attayne vnto the port in shortest tyme: and also if anye stormes doo happen by the waye, to consider how for to preserue the shippe and the goodes, and to bring hir safe vnto the porte alligned. And also it is moste principally too be considered and foreseene, that if they haue had by occasion of a contrarye tempest, for to go very much out of the course or way, too knowe then howe that the place dooth then beare, that is to say, by what poynte of the Compasse the place doth stande from you: and also how farre it may be from you. Whiche waye too bee knowne is thys: Fyrste too consider by what poynte that the shippe hath made hir waye by, and how fast and swiftly that the shippe hath gone, and to consider how often that the ship hath altered hir course, and how much that shee hath gone at euerye tyme, and then to consider all thys in your Platte or Carde, and so you maye giue an neere gesse, by what poynt or wynde it beareth from you, and also howe farre it is thyther. And also you maye haue a great helpe by the Sunne or Starres, too take the heigth of the Pole aboue the Horizon, and also in some place you may gesse by the sounding, both by the depth, and also by the grounde. And also it is very meete and necessary to knowe any place, when that hee dooth see it.

27. *Of instrumentes to vse at the Sea for to take the heigth of the Sunne or any Starres.*

ALl Instruments too take the heigthe of the Sunne, or anye Starre, the Originall of the making thereof, it is eyther a Circle, or the parte of a Circle, whose diuision is the 360. parte of a circle, what forme soeuer that it hath, as your crosse staffe, it is marked according vntoo the pro-

portion

portion of a circle, and euery one of the degrees, is the equall parte of a circle, the three hundred and sixtie parte, &c.

¶ The vse of the Instruments.

THe vse of the Instrumentes, as Astrolobes or common rings, or the crosse staffe, is to take the heigth of the sunne or other starres, whose vses doo folowe heerafter in the booke.

28. What manner of persons be meetest to take charge of Shippes in Nauigation.

As touching those persons that are meete to take charge, that is to say, to be as maister of shippes in Nauigation, hee ought to be sober and wise, and not to be light or rash headed, nor to be to sumish or hasty, but such a one as can wel gouerne himselfe, for else it is not possible for him to gouern his company well: he ought not to be too simple, but he must be suche a one as must keepe his company in awe of him (by discretion,) doing his company no iniurie or wrong, but to let them haue that whiche men ought to haue, and then to see vntoo them that they doo their labour as men ought to doo, in all poyntes. And the principall poynt in gouernment is, to cause himselfe both to be feared & loued, & that groweth principally by this meanes, to cherish men in well dooing, and those men that bee honestly addicted, to let them haue reasonable preheminence, so that it be not hurtfull vnto the Marchaunte nor to himselfe, and to punishe those that be malefactors and disturbers of their company, and for smal faults, to giue them gentle admonition to amende them: and principally these two poyntes are to be foreseene by the maisters, (that is) too serue God himselfe, and to see that all the whole company doo so in lyke maner, at such conuenient time as it is meete to be doone: the second point is, that the master vse no play at the dise or cards, neither (as neare as he can) to suffer any, for the sufferance thereof may doo very much hurt, in diuers respects: and furthermore, the maister ought to be such a one, as

dooth knowe the Moones course, whereby he dooth knowe at what time it is a full Sea, or a lowe Water, knowing in what quarter or part of the skye, that the Moone dooth make a full Sea at that place, and also the mayster ought to bee acquainted, or knowe that place well, that he doth take charge to goe vnto (except that he haue a Pilot) and also he that taketh charge vpon him, ought to be expert, how the tide gates or currentes doo set from place vnto place: and also not too bee ignohant of such daungers as lyeth by the way, as rockes, sandes, or bankes, and also most principally, he ought too bee suche a one, as can very well directe his courses vntoo any place assigned, and to haue capacitie howe for to handle or shift himselfe in foule weather or stormes. And also it behoueth him too be a good coaster, that is to say, to knowe euery place by the sight thereof. And also he that taketh charge for long voyages, ought to haue knowledge in plats or cardes, and also in such instrumentes, as be meete to take the heigth of the Sunne or any Starre, and to haue capacitie to correcte those instrumentes, and also he ought to be suche a one, that can calculate the Sunnes declination, or else to haue some true regiment, and also he ought to knowe howe too handle the Sunnes declination, when that he hath taken the heigth of the Sunne.

¶ Nowe beginneth the Regiment for the Sea, the first Chapter or rule of Nauigation, and sheweth what the 32 poyntes of the Compasse is, and to what vses they doo serue.

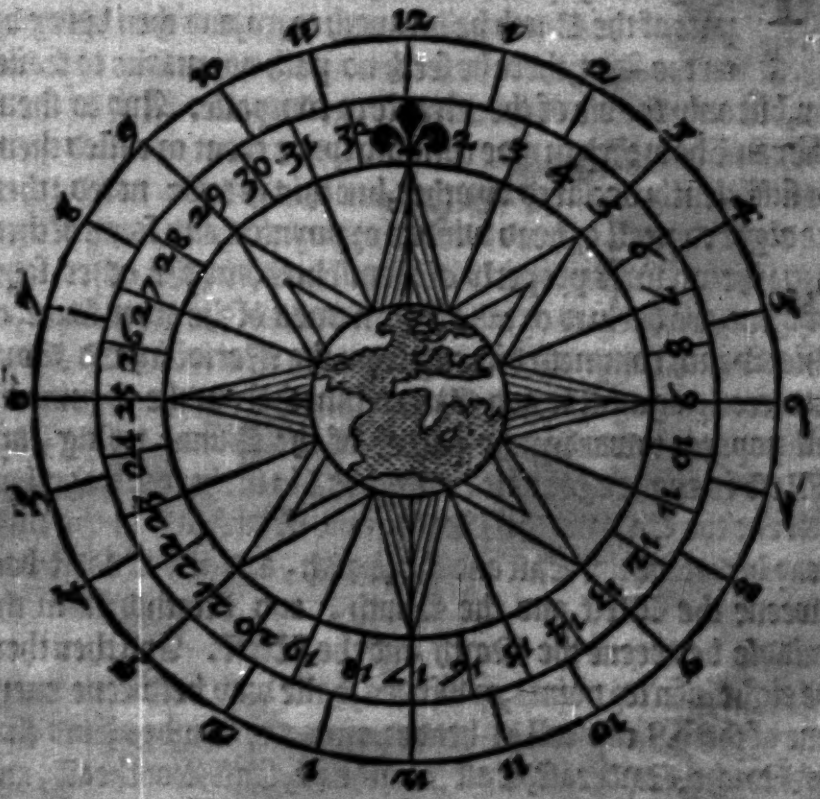
THe first and most principall thing for any Seafaryng man, or Traueller, is to knowe towarde what part of the Earth he meaneth to go, and then being vpon the Sea, there he seeth no path nor marke to trauell by, but only the vse of the Needle or compasse. And to shewe the cause how they in olde time did fynde them or called them, is sufficiently declared by other, but this is to be noted: there be eight capitall or head windes or poyntes, and foure of them haue their names properly of themselues, and the other foure of them, are derined or take their names of the other foure, as this: South commeth directly from the Meridian, and North is directly against it, and East commeth from the Equinoctiall poynte, towardes the partes of the Sunne rysing, and West is ryght against it. Northeast is in the midwaye betweene the East and the North, and Southeast in the midway betweene the East and the South, and Southwest betweene the West and the South, and Northwest in the middle betweene the North and the West. And then there be eight inferior points, or windes, halfe way betweene enery one of those, 8. capitall or heade poinctes or windes, and that is Northe Northeast, East Northeast, East Southeast, and Southe Southeast, and South Southwest, and Weste Southweste, and Weste Northweste, and North Northweste: and nowe betweene euery one of these inferior poynts, and euery one of the head wynds there is a bypoynt or winde, and he is called a bypoint, for that he is not named but by the name of one of the heade poinctes next adioyning. There be

Eight capitall or head poyntes.

Eyght inferior poyntes or wyndes.

16. of them in number, so that there be eyght capitall or hedy poyntes, and eyght inferior poyntes, and .16. bypoyntes or windes, so that in all there be .32. of them. The vse of these poynts is, to direct the shippe to what quarter of the worlde you doo assygne, too keepe that course too fynde the place so assygned, for that the propertie of the Needle or Flye, is alwayes to stand due South and North.

16. bipoints or windes.



As touching Naulgation, for the instructions of the meane I, I haue set this figure or compasse, where first is too be noted the .32. windes and points of the compasse aboue made. The Flourdeluce is the first point, and these be the names, beginning at the North, and so with the course of the Sunne,

to say

to say, North. 1. North and by East. 2. North Northeast. 3. North east and by North. 4. Northeast. 5. Northeast and by East. 6. East Northeast. 7. East & by North. 8. East. 9. East and by South. 10. East Southeast. 11. Southeast and by East. 12. Southeast. 13. Southeast and by South. 14. South Southeast. 15. South and by East. 16. South. 17. South and by West. 18. South Southwest. 19. Southwest & by South. 20. Southwest. 21. Southwest & by West. 22. West Southwest. 23. West and by South. 24. West. 25. West and by North. 26. West Northwest. 27. Northwest & by West. 28. Northwest. 29. Northwest and by North. 30. North Northwest. 31. North and by West. 32. This is the whole contentes of the. 32. windes, and there is in the compasse the contentes of the great circle, or Equinoctial Circle, being. 360. degrees in compasse, so that euery poynt conteyneth. 11. degrees and. 4'. and. 4. poynts containe. 45. degrees. 8. poyntes containeth one quarter of the compasse or Equinoctial circle, being. 90. degrees. 16. pointes conteineth halfe the Circumference. 180. degrees, & euery degree containeth 60. seconds and so fooyth. Furthermore, the. 32. poyntes containe. 24. houres, that is to say, one poynt containeth. 3. quarters of an houre. 45. minutes: and. 2. poyntes one houre and a halfe. 4. poyntes. 3. houres: 8. poyntes. 6. houres. 12. poyntes. 9. houres: 16. poyntes. 12. houres, and so to the rest of the poynts. And euery houre containeth. 60. minutes: and euery halfe houre. 30. minutes, and euery quarter of an houre. 15. minutes: and after that rate. 45. minutes maketh three quarters of an houre.

The names of the. 32. points of the compasse.

The cõtents of the Equinoctiall circle. 360. degrees: one poynt of the Compasse contayneth 11. degrees & a quarter.

The. 32. poyntes brought into 24. houres.

¶ The second Chapter or Rule treateth of the Golden number or Prime, shewing the Epact, and by the Epact, to knowe the age of the Moone.

IT is necessary and conuenient for the Seafaring men, to knowe the Prime or Golden number: for by the Golden number is knowne the Epacte, and the Epacte sheweth the age of the Moone or chaunge day, within.12.houres vnder or ouer: and by the age of the Moone, you may knowe at what a clocke it doth flowe in any place that you doe knowe what Moone doth make a full Sea: therefore it is meete to knowe the Epact, and that is knowne by the Prime, or Golden number. The cause why it was called the Golden number, was bycause it was sent out of Egypte in letters of gold, too the Romaines or Citie of Rome. The cause why that it is called the Prime, was for that it was the first order that the Moones course was known by, and it is thus knowne. Adde one too the yeare of our Lord that you would knowe the Golden number or Prime of, then deuide the number by.19.the remainer is the Prime: and multiply that by.11.and looke what the number commeth vnto, deuide that by.30.the remainer is the Epact. Then when you haue once the Epact, adde.11.to your Epact for euery yere more, and looke what that commeth to, that is your Epact: and if it do passe.30.put that away, and keepe the remainer for your Epact. And thus this rule will serue for euer, sauing when the Prime beginneth at one, for then the Epacte is.11.and then doe (as afore sayd) as you may perceyue by this table heere folowing.

The cause why that it was called the Prime, or Golden number.

To knowe how many the Epact is

The

¶ The table of Prime and Epact for. 19. yeares, and when those. 19. yeares be ended, then begynne againe, and so it vvyll serue for euer, &c.

The yeare of the Lorde.	Prime.	Epact.	The yeare of the Lorde.	Prime.	Epact.
1574	17	7	1584	8	28
1575	18	18	1585	9	9
1576	19	29	1586	10	20
1577	1	11	1587	11	1
1578	2	22	1588	12	12
1579	3	3	1589	13	23
1580	4	14	1590	14	4
1581	5	25	1591	15	15
1582	6	6	1592	16	26
1583	7	17			

The Prime is the tyme of. 19. yeres.

THe Prime or Golden number, is the tyme of. 19. yeares, in the which tyme the Moone maketh all her chaunges or coniunctions with the Sunne, and when these nyneteene yeares bee expyred, then shee begynneth againe; as for example. This yeare beyng the yeare of our Lorde. 1574. shee chaunged the two and twenty day of March, and euery yeare doth alter. 11. dayes of hir change, tyl the yeare. 1593. and then she chaungeth the said. 22. day of March againe, as I shewed you before. The Epact is the putting to. 11. for euery yeare. Now furthermore to knowe the age of the Moone, doo thus: take the number of the Epact for your yere (beginning at March alwayes) and recken how many monthes it is from March, (counting March for one,)

To knowe the age of the Moone by the number of the Epact.

then recken howe many dayes of the moneth it is in whiche you would knowe the age of the Moone: Then put all your numbers togither, (that is to say, your Epact, your moneth from March, and euery day of the moneth,) then looke howe many it amounteth vnto, that is the age of the Moone, but if it passe. 30. throw all the. 30. away, and keepe that that wyll not be. 30. for when the age of the Moone is iust. 30. then is it the chaunge day: and if it be the fifteenth day of the age of the Moone, then the Moone is at the full. When the age is betweene seuen dayes and eight, then is the first quarter. And if it bee. xxii. dayes old, then the Moone is at the last quarter: as for example, this yeare. 1574. I looke and find the Epact 7. for the yeare: nowe I would knowe the age of the Moone, the. 13. day of June. Nowe I recken how many monethes it is from March, reckenyng March for one, and I finde it is foure monethes: then I take and adde all these togither, that is to say, seuen for the Epact, and foure for the monethes (that is to say, March, Aprill, May, June) and then. 13. for the dayes of the moneth, and al commeth to. 24. So that you may conclude, that the moone is. 24. dayes old, and was at the last quarter two dayes before.

¶ The third Chapter or rule treateth, how to know by the age of the Moone, what houre it dooth flow, or is full Sea at any place, where you doo knowe vvhat Moone maketh a full Sea.

NOw by the age of the Moone you may knowe at what houre it floweth in any place, where you do know what Moone maketh a full Sea, whiche Rule commonly the Sea men cal the shifting their Sumne and moone: and many wayes there be to doo it, for thus they may doo it: let them

diuide

diuide one houre into fiue partes, & then take .4. of those parts, and put the fifth part away, that serueth for the alteration of 24. houres, & the foure fift parts of an houre, are .48. minuts, and the .5. part of an houre is .12. minutes. A flood and an ebbe doth alter .24. minutes forwardes: as this for example: it floweth at .12. of the clocke at the Lands end, vpon the chaunge day, the moone being in the South: at all tymes a full Sea. The moone being one day old, it floweth at .12. of the clocke. 48. minuts. 2. dayes old, it floweth at one of the clocke .36. minutes. 3. dayes old, it floweth at .2. of the clocke .24. minutes: foure dayes old, it floweth at .3. of the clock .12. minutes: fyue dayes old, it floweth at .4. of the clock iust: sixe dayes old, it floweth at .4. of the clock .48. minutes: seuen dayes old, at .5. of the clocke .36. minutes: eyght dayes old, at .6. of the clocke .24 minutes: nyne dayes old, at .7. of the clocke .12. minutes: ten dayes old, it floweth at .8. of the clocke iust: eleuen dayes old, at .8. of the clock .48. minuts .12. dayes .9. of the clocke .36. minuts: 13. dayes old, 10. of the clock .24. minuts: 14. days old, it floweth at .11. of the clock .12. minuts: 15. dayes old, it floweth at .12. of the clock iust, then being the ful moone: and so begin againe as you dyd before at one day old, and so forth. For the course of the tides is nothing else but to adde for euery daye of the age of the moone one houre, pulling backe the fifth part of an houre (being .12. minuts) and by this accompt you may at all tymes knowe at what a clocke it doth flowe, by putting to euery floud and ebbe .24. minuts, and to .2. floods and .2. ebbes putting to .48. minuts. Now furthermore the Seamen vse to make their accompt by this meanes (but it is all one) they do allow for euery day of the age of the Moone, one point and .3. minuts: for a point of the compasse conteineth 45. minuts, that is .3. quarters of an houre. Then they put .3. minuts to .45. minuts, which maketh .48. minuts, the sayd .3. minuts be the .15. part of a point, and from the chaunge to the full is .15. days, so that (the halfe compasse being .16. pointes) they breake the odde point into .15. partes, and that commeth

To knowe the alteratiō of the tydes in .24. hours

An ensample for the full Sea vpō the lands end, for euery day of the age of the Moone.

To fynd the Sunne and the Moone by the points of the compasse.

to.3.minuts,so that the alteration of the tides, for euery.24. houres, be.48.minuts, or the.4. fifth partes of an houre. Wherfore there shal follow a table of tides about certain places of this realme:for euery Moone conteineth.29.dayes.12. houres.44.minuts from chaunge to chaunge: the whole contents of the houres of the Moone,be.708.houres,and.44.minuts. And there is in euery yeare.12.chaunges of the Moone: and the yeare conteineth.365.dayes.5.houres.55.minuts.13.seconds. Yet some do affirme to be odde.6.houres, but there lacketh.4.minuts.47.seconds in the tropical yeare. Lykewise in the yeare be.12.monethes agreable to the.12.Moones: the 12.Moones conteine but.354.dayes,so that there be.11.daies more in the yeare,than there be in the.12.moones. The yeare also is deuided into.12.mooneths,which moneths haue taken their names at the will and pleasure of menne: as first Januarp was so called, of Ianus, bycause of.2.heades, for the month of Januarp beholdeth the end of the yeare past, and the begining of the yeare to come. Februarp tooke his name of certaine Romane sacrifices called Februa. Marche is so called of Mars,for Romulus so named it after his father. Aprill cõmes of Aperio,bycause that then the earth is opened. Maie of Maia,the mother of Mercury,Iune so called by preparing to the warre. Iuly of Iulius Cæsar, & Augustus of Augustus Cæsar,for in that month he entered the cõsulship: then the rest of the months toke their names of their number frõ March. Now these.12.months which maketh the yeare, the Sunne doth passe or go through the Zodiack called the.12. signes, which is the occasion of the yeare,for this is to be noted,that the sunne, as I sayd before, doth go by his naturall meuing in.365.dayes.5.houres.55.minuts.13.seconds,through the Zodiack,conteining.360.degrees,his course being ageinst the 24.houres, going from the West into the East, against the course of primum mobile,or first mouer,being meued by the mighty prouidence of God,which maketh the.24.houres:and so doth all the seuen lyghts or planets, (except) that it be in their

The content of the nũber of dayes and houres in one Moone: the houres in euery moone be.708.44. minutes.

The content of a yeare is 365.dayes. 5.houres.55 minutes.

How the moneths tooke the.r names.

The Zodiack containeth. 360.degrees

The moning of.24.houres

their retrogratiõ: but the Sunne and the Moone, be neuer retrograt, as the other. 5. planets or lyghts be. And this is to be noted, that the Moone goeth faster thã the Sunne, for she goeth through the whole Zodiack in. 27. dayes and. 8. houres. Now in that same time the sunne is remoued by his naturall mouing from that place of the Zodiack neare. 27. degrees: and then bycause that the Moone hath not found the Sunne there, it is. 2. dayes, foure houres, foure and forty minuts more before that the Moone ouertaketh the Sunne ageine, so by that meanes it is. 29. dayes, twelue houres and. 44. minuts betweene the chaunge of the Moone and the next chaunge, one Moone with another throwe the yeare, although that the Moone may change sometime in lesse time, and sometime in longer time, that is by the meanes of the. 3. motions of the Moone, that is to say, hir swift motiõ, and hir middle motion, and hir slow motion, which groweth by the meanes of the moones Auge or opposition thereof. The Moone being in Auge, goeth but litle more thã. 12. degrees in. 24. houres. And in the opposition of Auge neere. 15. degrees in. 24. houres, & in hir middle or equal motion. 13. degrees. 12. minuts. So this is the occasion why sometime the Moone may change sooner, or be defracted longer than the time of. 29. dayes. 12. houres and 44. minuts. This point of Auge is mouable, and doth passe throwgh the Zodiack in the time of. 19. yeares: and it causeth sometime the full of the Moone to happen sooner and later. In like manner also the quarters of the Moone, with all the other aspects that the Moone hath with the Sunne, or any other of the planets, according too the moones motion. In like maner (by the meanes of the. 3. motions of the Moone) sometime the Moone goeth more thã one point and. 3. minuts in. 24. houres, and sometimes lesse than one point and. 3. minutes, as this for example: the Moone being in hir slow motiõ, goeth but litle more than. 12. degrees in. 24. houres, and then the Sunne in that time doth go one degree: and thẽ is there but. 11. degrees betweene the Sunne and the Moone (that is, but. 44. minuts.)

The tyme that the moone goeth throwe the 12. Signes.

The. 3. motions of the Moone.

Of Auge.

The cause why the moone chaungeth rather or later.

The Moone goeth in. 24. houres sometymes more degrees, and sometyme fewer degrees

So

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The moone is not one poynt asunder from the Sun in. 24. houres.

So that the Moone is not one point in.24.houres from the sunne. But being in hir swift motion she goeth neere.15. degrees in.24.houres, and the Sunne goeth one degree in that time: so that there is. 14.degrees in.24.houres, betweene the Moone and the Sunne, (that is.56.minuts) which is a point, and.11.minuts.23. But notwithstãding I would not wish the common Marriners to trouble themselues with these matters, but to followe their accustomed ryder, to allowe for euery day of the age of the Moone, one point, and.3. minutes. &c.

The moone is in. 24. houres. 1. poynt and 11. minutes asunder frõ the Sunne.

And thus much haue I sayd of the Moones motion: for that some Sea men will take vpon them to correct the Almanaks as touching the chaunge and quarters of the Moone: holding this opinion, that euery Moone ought be equal in the number of the dayes and houres: and the full moones to be iust the halfe contents. And the quarters in lyke manner, the iust.4. part in dayes and houres, so that some of them will take vpon them to tel (by the rule of the epact,) the true houre of the change, quarters, and full of the Moone. Wherein they are notably deceyued. Agein, sometime in the yeare you shall see the Moone rarer thã at some other time, as this for example. from January to June you shall see the Moone within.24. houres after the chaunge: bycause she hath North declination of the Sunne, and maketh a bigger arche thã the Sunne. From July to December, you shal not see the Moone.3. days after the chaunge: bicause hir declination is to the South part of the Sunne: but you may see hir in.24.houres, before hir chaunge. Now the Sea men do imagin a prime day, which is the halfe quarter of the Moone: that is, when the Moone is thre days and.18.hours old, (the Moone being then.4.points to the Eastward of the Sunne, which is.3.houres:) the same rule may they in like care obserue when the Moone is passe the full.3.days and.18.houres, and also in the middes of the quarters.

Errour of Mariners.

Now

Here foloweth a table of Tides.

FIrst, the Moone South or North: on Landes ende full Sea.

The Moone South and by East: at the Goze ende full Sea.

The Moone South Southwest: betweene holy Iland and Tinemouth, full Sea.

It floweth betweene Tinemouth and Flambzough head, Southwest, and Northeast Moone.

It floweth betweene Flambzough head and Bzidlington, in the Bay: a Southwest and by West Moone.

The Moone in the West Southwest: betweene Bzidlington and Laurenas full Sea.

It floweth betweene Laurenas and Cromer all along the well: an East and West Moone.

It floweth betweene Cromer and Yarmouth Rode, to Laystow North Rode: a Southeast Moone.

It floweth betweene Laistowe Rode and Dzforde nas: a Southeast and by South Moone.

It floweth betweene Dzford, & Dzewell wondes: a South Southeast Moone.

It floweth betweene the Naase and the Ware head of Colne a South and by East Moone.

It floweth at the Spittes and at the Sheue and al alongst the Swimme: a South Moone.

At the West ende of the Noze: a Southe and by West Moone full Sea.

It floweth at Grauesend: a South Southwest Moone.

It floweth at London Bzidge: a South west Moone.

It floweth at the North Foxlande: a South Southeast Moone, & so alongst the coast til you come to Bechey. And in the Okon from the North Foxlande to the South Foxland: it runneth halfe tide. And from the South Foxland to the Naase:

the tide runneth halfe tyde halfe quarter. And from the Naale to Fairely: it runneth halfe tide, and from Fayzely to Beche: it runneth quarter tide vnder other.

It floweth to the Weastward of Beche, a kenning: a Southeast and by South Woone.

It floweth at Portesmouth: a Southe and by Easte Woone.

It floweth at S. Elens: a South Southeast Woone.

It floweth on the Sea side of the Iland: a Southeast and by South Woone: and so on the Land, and at the Needles, and runneth quarter tide in the Oftonne.

It floweth at Poole in the Hauen: a Southeast Woone.

It floweth at Waymouth: an East and Weaste Woone.

It floweth at Portland a Southeast Woone.

It floweth from the Weaste parte of Portlande, tyll you come vntoo Plymmouth: an Easte and Weaste Woone.

It floweth on the shoare from Plymmouth too the Lyzard: a West and by Southe Woone. And in the Oftonne a Southeast Woone.

It floweth at Mountes Baye: an Easte and Weaste Woone.

It floweth at Selly: a West and by South Woone.

It floweth at the Landes ende of Goolse: a West South west Woone.

It floweth all alongst the coast vp to Bristowe, and the coast of Ireland, from waterford to Kinsale: a Weaste and by South Woone.

Furthermoze it floweth (foz the most part) from the Poll head of Burdeauz all alongst the coast of Biskey, Galyza, Portingale, till you come to the straightes of Maliga, a Southwest and Northeast Woone.

It floweth at Flushing: a Southweast and by Southe Woone.

It floweth at Antwerp: an East and West Moone.

It floweth all alongst the coast of Flaunders, from the Wildings to Calys, a South and by East moone: and so runneth halfe a tide vnder the other.

Nowe heere is one speciall thing to be noted, and that is this: It floweth one poynt of the Compasse more in the Spring streames, than it dooth in any of the quarters of the Moone (so that it be a ryuer where there is any indraft, hauyng distance from the Sea) when there is neither rage of wyndes, nor any cause either to hynder or further the saide effecte. As for example thus: It floweth at Graueseude at the chaunge of the Moone or full, a Southe Southweast Moone. But in any of the quarters of the Moone it scant floweth a South and by West Moone: and this is generally for euer.

It will flow a poynt of the compasse more in the spring tides than in the neap tides in a Riuer that hath any distance vnto the sea.

The fourth Chapter treateth of the Sunne and Moones course in the Zodiacke: and how you shal know what houres the Moone shall rise and set at: and at what poynt of the Compasse: with other necessary thinges.

Furthermore, the Sunne (by hys naturall mouynge thorough the twelue Signes in the Zo-

diacke, in the yeare) doth cause the heigth and loweneſſe of his Declination: whiche is neceſſarie for the Seafaring men to knowe, in which declination they doo take from equinoctiall to Equinoctiall: and this is to be noted, that as the Sunne hath Declination, ſo in lyke manner hath the Moone, for by hir declinatian, and the Sunne, is knowne the tyme of hir ſhining or abiding aboue our Horizon. The Sunne or Moone in the firſt minute of *Aries*, doo riſe Eaſt, and ſette Weſt, and ſhine. 12. houres. In the firſt minute of *Taurus*, they riſe neare the Eaſte Northeaſt, and ſet neare the Weſt Northweſt, and ſhine. 14. houres. In the ſigne of *Gemini*: they riſe neare the Northeaſt and by Eaſt, and they ſet neare the Northweſt and by Weſt, and ſhine. 16. houres. In the ſigne of *Cancer* the firſte minute: they make their greateſt declination to the Northwardes, and they ryſe neare the Northeaſt, and ſet neare the Northweaſt and ſhinne neare. 17. houres. In the firſt minute of *Leo*, (deſcending towardesthe equinoctiall,) as they did in *Gemini*. And in the ſigne of *Virgo*, as they did in *Taurus*. And in the firſt minute of *Libra*, equinoctiall: beginning South declination, as in *Aries*. And in the firſt minute of *Scorpio*: they riſe neare the Eaſt Southeaſt, and ſet neere the Weſt Southweaſt, and ſhine. 10. houres. In the firſt minute of *Sagittarius*: they ryſe neere the Southeaſt and by Eaſt, and ſet neere the Southweſt and by Weaſt, and ſhyne. 8. houres. In the firſt minute of *Capricornus*, they haue their greateſt declination to the South, and begin to returne to the equinoctiall, riſing neare the Southeaſt, and ſetting neere the Southweſt, and ſhine more than. 7. houres. In the firſt minute of *Aquarius*, as in *Sagittarius*. In the firſt minute of *Piſces*: as in *Scorpio*. Nowe by this rule you may know the riſing and ſetting of the Moone for euer: as thus: I haue ſhewed you before in the ſhifting of the Sunne & Moone, that for euery day of the age of the Moone, the Moone goeth eaſtward one poynt & .3. minutes: in. 2. dayes. 2. poynts & .6. minuts. &c. Nowe when you liſt to knowe the verye houre and tyme of

To know how long the Moone shyneth.

To knowe what houre or point the Moone ryſeth or ſetteth.

of hir rising: Looke how manye dayes the Moone is olde, then put so many pointes, and so many .3. minutes, and looke what it amounteth vnto. Which for your better vnderstanding, I will shew by example: and first of the Moones being South, by euery day of the age of the Moone. The Moone being one day olde: is South at .12. of the clocke .48. minutes. The Moone being .2. dayes olde, is South at one of the clock .36. minutes in the after noone. Three dayes old: South at .2. of the clocke .24. minutes. Foure dayes old, at three of the clock 12. minuts. Fyue dayes old, at .4. of the clocke iust. Sixe days old, at .4. of the clocke .48. minuts. Seuen dayes old, at .5. of the clock .36. minuts. When the Moone is iust a quarter old, shee is South at .6. of the clocke at night. At eight dayes old, the moone is South at .6. of the clocke .24. minuts. At .9. days old, at .7. of the clocke .12. minuts. At .10. dayes old, at .8. of the clocke iust. at .11. dayes old, at .8. of the clocke .48. minuts. At 12. dayes old, at .9. of the clocke .56. minuts. At .13. dayes old, at .10. of the clocke .24. minuts. At .14. dayes old, at .11. of the clocke .12. minutes. At .15. dayes olde (being the full Moone) she is then South at midnight. One day after the full Moone: she is South at .12. of the clocke .48. minutes at midnight. Two dayes after the full: at one of the clocke .36. minutes. Three dayes after, at .2. of the clocke .24. minutes. Foure dayes after, at .3. of the clocke .12. minutes. Fiue dayes after, at .4. of the clocke, iust in the morning. Sixe dayes after, at .4. of the clocke .48. minuts. Seuen dayes after, at .5. of the clock 36. minutes. When the Moone is three quarters olde, she is South at .6. of the clocke in the morning. At .8. dayes after the full, (beeing the first day after the quarter) at .6. of the clocke 24. minutes. .9. dayes after: at .7. of the clocke .12. minutes. .10. dayes after, at .8. of the clocke iust. .11. dayes after, at .8. of the clocke .48. minutes. .12. dayes after, South at .9. of the clocke 36. minuts. .13. dayes after, south at .10. of the clock in the fore-noone .24. minutes. .14. dayes after, at .11. of the clocke .12. minutes. At .15. dayes after, the Moone doth chaunge (beeing

To knowe what houre the Moone is South for euery day of the age of the Moone.

Of the change

Of the full Moone

Quarter of the Moone.

Example of the Moones ryſing and ſetting.

The Moone hath Latitude.

then with the Sunne) for the chaunge of the Moone is when the Moone and the Sunne be both vnder one like degree and minute of any ſigne of the Zodiacke. The full Moone is, when the Sunne and the Moone be oppoſite (the one being directly againſt the other, a full. 6. ſignes aſunder) as you may perceiue at the full Moone: for then when the Moone riſeth, the Sunne ſetteth: and when the Sunne riſeth, the Moone ſetteth. The quarters be, when the Sunne and Moone be full. 3. ſignes aſunder, (that is, full. 90. degrees.) Now when you liſt to know the very time of the Moones riſing or ſetting, looke in your Kalender, what ſigne and degree the Moone is in: then according to the rule of the ſhining, deuide that into. 2. equal parteꝛ, then from the South, ſo ſhal you ſee at what houre the Moone riſeth, as for example this. In March alwayes the Sunne is in *Aries*, then the Moone being in hir firſt quarter, then ſhe is 6. houres to the Eaſtward of the Sun, then the Moone muſt needes be in *Cancer*. Then ſhineth the Moone in our Horizon 7. houres, then the Moone is South at. 6. of the clock, the ſhe ſhineth. 8. houres and a halfe after. 6. of the clocke. So that ſhe ſetteth at. 2. of the clocke and halfe an houre paſt, then ſhe ryſeth in the day. 8. houres and a half, before. 6. of the clock, that is, at. 9. of the clocke and halfe an houre paſt. Now at the laſt quarter in March, then the Moone muſt needes be in *Capricornus*, then ſhineth the Moone but. 7. houres, then the Moone is South at. 6. of the clock in the morning, then the Moone riſeth. 3. houres and a halfe before, that is, at. 2. of the clocke and halfe an houre paſte in the morning, then ſhe ſetteth by day at. 9. of the clocke and halfe an houre paſt, and this rule will ſerue for euer, without any great erroꝛ. But yet there is a further matter for the exacte doing, which is the Latitude of the Moone from the heade or tayle of the Dragon, but that is but a trifle in reſpecte of much erroꝛ, and therfoꝛe I will not trouble you with that: yet there is one thing whiche I would Seafaring men ſhould conſider, although a great miſter be expert in that, yet it is meete to be ſpoke of, as this. The

Sunne

Sunne being in *Cancer* or Moone in like maner, or in *Gemini*, or any tyme when the Sunne or Moone hath North declination, they will set their compasse before them, and when they see the Sunne giue an Easte shadowe, they will saye that it is .6. of the clocke, which and if the Sunne be in *Cancer*, it is not much passe fiue of the clocke, and the more to the Southwardes, the more they doo erre. And in lyke case, the Moone being in *Cancer* when they do see the Moone giue an East shadowe by their compasse, they will say the Moone is Weast, but they doo not consider, that the Sunne and the Moone being in *Cancer*, commeth so neare our Zenithe or Verticall poynte right ouer our heade, whiche is the verie heigth of their declination, comming so neare them, therfore they must iudge the East or Weast from the Pole or North starre, if they will iudge truely. Wherefore I do much commende the Equinoctiall Dyales for the exacte truth, for they can not know the truth by their compasse, so that the Sunne or Moone, or any other Starre, haue any great declination being in *Cancer*: and you must consider this in lyke maner. The Sunne hauing North declination, the further you doo goe to the Northwardes, the longer is youre daye, and the shorter is your night, and towardes the Southwarde, the shorter dayes and longer nightes. Now contrarywyse, the Sunne hauing South declination, the more to the Northwardes, the shorter dayes, and the longer nightes, the further to the Southwardes, the longer dayes & shorter nightes, and vnder the Equinoctiall, the nightes and dayes all one what declination soeuer the Sunne hath: but this rule that I haue giuen you, is for London, or any other place that hath that Latitude or elenation of the Pole Artick at .51. or .52. degrees.

You cannot know what a clocke it is by the compasse, the sun being in the north signes.

Error of the shadowe of the Moone.

The Equinoctial dials be very good

As touching the length & shortnesse of the day and nyght.

The

Of the chaunge

Of the full Moone

then with the Sunne) for the chaunge of the Moone is when the Moone and the Sunne be both vnder one like degree and minute of any signe of the Zodiacke. The full Moone is, when the Sunne and the Moone be oppolite (the one being directly againſt the other, I mean iuſt. 6. ſignes aſunder) as you may perceiue at the full Moone: for then when the Moone riſeth, the Sunne ſetteth: and when the Sunne riſeth, the Moone ſetteth. The quarters be, when the Sunne and Moone be iuſt. 3. ſignes aſunder, (that is, iuſt. 90. degrees.) Now when you liſt to know the very time of the Moones riſing or ſetting, looke in your Kalender, what ſigne and degree the Moone is in: then according to the rule of the ſhining, deuide that into. 2. equal partes, then from the South, ſo ſhal you ſee at what houre the Moone riſeth, as for example this. In March alwayes the Sunne is in *Aries*, then the Moone being in hir firſt quarter, then ſhe is 6. houres to the Eaſtward of the Sun, then the Moone muſt needes be in *Cancer*. Then ſhineth the Moone in our Horizon 7. houres, then the Moone is South at. 6. of the clock, thē ſhe ſhineth. 8. houres and a halfe after. 6. of the clocke. So that ſhe ſetteth at. 2. of the clocke and halfe an houre paſt, then ſhe ryſeth in the day. 8. houres and a halfe, before. 6. of the clock, that is, at. 9. of the clocke and halfe an houre paſt. Now at the laſt quarter in March, then the Moone muſt needes be in *Capricornus*, then ſhineth the Moone but. 7. houres, then the Moone is South at. 6. of the clock in the morning, then the Moone riſeth. 3. houres and a halfe before, that is, at. 2. of the clocke and halfe an houre paſte in the morning, then ſhe ſetteth by day at. 9. of the clocke and halfe an houre paſt, and this rule will ſerue for euer, without any great error. But yet there is a further matter for the exacte doing, which is the Latitude of the Moone from the heade or tayle of the Dragon, but that is but a trifle in reſpecte of much error, and therfore I will not trouble you with that: yet there is one thing whiche I would Seafaring men ſhould conſider, although a great number be expert in that, yet it is meete to be ſpokē of, as this. The

Quarter of the Moone.

Enſample of the Moones ryſing and ſetting.

The Moone hath Latitude.

Sunne

Sunne being in *Cancer* or Moone in like maner, or in *Gemini*, or any tyme when the Sunne or Moone hath North declination, they will set their compasse before them, and when they see the Sunne giue an Easte shadowe, they will saye that it is .6. of the clocke, which and if the Sunne be in *Cancer*, it is not much paste fiue of the clocke, and the more to the Southwardes, the more they doo erre. And in lyke case, the Moone being in *Cancer* when they do see the Moone giue an East shadowe by their compasse, they will say the Moone is Weast, but they doo not consider, that the Sunne and the Moone being in *Cancer*, commeth so neare our Zenithe or Uertical poynte right ouer our heade, whiche is the verie heigth of their declination, comming so neare them, therfore they must iudge the East or Weast from the Pole or North starre, if they will iudge truely. Wherefore I do much commende the Equinoctiall Dyales for the exacte truth, for they can not know the truth by their compasse, so that the Sunne or Moone, or any other Starre, haue any great declination being in *Cancer*: and you must consider this in lyke manner. The Sunne hauing North declination, the further you doo goe to the Northwardes, the longer is youre daye, and the shorter is your night, and towardes the Southwarde, the shorter dayes and longer nightes. Now contrarywyse, the Sunne hauing South declination, the more to the Northwardes, the shorter dayes, and the longer nightes, the further to the Southwardes, the longer dayes & shorter nightes, and vnder the Equinoctiall, the nightes and dayes all one what declination soeuer the Sunne hath: but this rule that I haue giuen you, is for London, or any other place that hath that Latitude or eleuation of the Pole Articke at .51. or .52. degrees.

You cannot know what a clocke it is by the compasse, the sun being in the north signes.

Erroz of the shadowe of the Moone.

The Equinoctial dials be very good

As touching the length & shortnesse of the day and nyght.

The

¶ *The fifth Chapter or rule, is of a table of declination commonly called of Seafaring men, a Regiment of the Sunne, exactly calculated for foure yeres, and will serue for. 24. yeres, for euery day of the moneth.*

NOw shal folowe a table of declination or Regiment for 4. yeres, being calculated for England, and wil serue al Europe without much error, or anye other countreye or place that hath our Longitude, as the most parte of Africa, as Ginnie, and those partes to the Southwardes, as farre as the Antarticke pole, serving for euery day of the month, very necessary for them that doo vse to trauell either by Sea or by land, and is one of the pryncipall pointes in Nauigation, for long voyages, and the cause why I haue written this Regiment for the Sea, or tables of declination, is for that I doo knowe that euery person that goeth vnto the Sea as maister of a shippe, hath not capacitie to calculate the Sunnes declination, by the place of the sunne, although they haue the tables of declination, as the Ephemerides, or Martin Curtise, otherwise called the art of Nauigation. Wherfore I haue written these notes, and Regiment or table of declination for. 4. yeres, and the first row towards your left hand, is the dayes of the moneth: the next rowe is the degrees of declination that the Sunne hath at the instant time of noone: and the thirde rowe is the odde minutes of declination belonging to the degrees.

Euery person cannot calculate the Sunnes declination.

Now there be two times in the yere that the Sunne hath no declination, as this. For the first yere after *Bissextilis*, (which was in the yere of our Lord. 1573. the. 11. day of Marche, at. 4. of the clock in the morning) the Sun was vpō the equinoctiall beginning North declination. And in like maner the 13. day of September at noone, the Sunne was vpon the Equinoctiall beginning South declination, and also the second yere after *Bissextilis*, which is the yere of our Lorde. 1574. the sunne is vpon the Equinoctiall the. 11. day of March, betwen

Two times in the yeare the Sunne hath no declination. 1573

10.and.11.of the clock before noone, beginning North declination: and in like manner the.13.day of September,at.6.of the clocke in the after noone, beginning South declination. Furthermore,in the thirde yere after *Bissextilis*, which is the yere of our Lorde.1575.the sunne is vpon the Equinoctial the 11.day of March, betweene foure and fiue of the clocke in the after noone,beginning North declination,& so in like maner the.13.day of September,at.12.of the clock at midnight, beginning South declination. Lastly,in the yere of our Lorde 1576.that is the yere *Bissextilis* it selfe. Vpon the.10.day of Marche the Sunne shall be vpon the Equinoctiall betweene 10.and.11.of the clocke at night, beginning North declination:and in like manner the.13.day of September,at.6.of the clocke in the morning,beginning South declination: Nowe these foure yeres beeing expired,you must after the yere *Bissextilis*,beginne againe at the yere one, as heere doth followe for example.

Yeare 1.	*Yeare 2.*	*Yeare 3.*	*Yeare Bissextilis*
1573	1574	1575	1576
1577	1578	1579	1580
1581	1582	1583	1584
1585	1586	1587	1588
1589	1590	1591	1592

January.			February.				March.		
D.	G.	M.	D.	G.	M.		D.	G.	M.
1	21	52	1	14	7		1	3	49
2	21	43	2	13	47		2	3	26
3	21	33	3	13	26		3	3	2
4	21	23	4	13	6		4	2	38
5	21	12	5	12	46		5	2	14
6	21	1	6	12	26		6	1	15
7	20	49	7	12	5		7	1	27
8	20	37	8	11	44		8	1	3
9	20	25	9	11	22		9	0	39
10	20	12	10	11	1		10	0	16
11	19	59	11	10	39	Equino-	11	0	8
12	19	46	12	10	18		12	0	32
13	19	32	13	9	56		13	0	55
14	19	17	14	9	33	ctiall.	14	1	19
15	19	3	15	9	11		15	1	42
16	18	47	16	8	49		16	2	6
17	18	32	17	8	26		17	2	29
18	18	17	18	8	4		18	2	53
19	18	1	19	7	41		19	3	17
20	17	45	20	7	19		20	3	40
21	17	28	21	6	56		21	4	3
22	17	11	22	6	33		22	4	26
23	16	54	23	6	10		23	4	49
24	16	37	24	5	46		24	5	12
25	16	19	25	5	23		25	5	35
26	16	1	26	5	0		26	5	58
27	15	42	27	4	36		27	6	21
28	15	23	28	4	13		28	6	44
29	15	5					29	7	6
30	14	46					30	7	28
31	14	26					31	7	

South declination.

South declination.

North declination.

April.

Apryl.			May.				June.		
D.	G.	M.	D.	G.	M.		D.	G.	M
1	8	13	1	17	49		1	23	8
2	8	35	2	18	5		2	23	12
3	8	57	3	18	20		3	23	15
4	9	19	4	18	35		4	23	18
5	9	41	5	18	49		5	23	22
6	10	2	6	19	4		6	23	24
7	10	23	7	19	17		7	23	26
8	10	44	8	19	31		8	23	27
9	11	6	9	19	44		9	23	27
10	11	25	10	19	57	Solstic.	10	23	28
11	11	45	11	20	8		11	23	28
12	12	9	12	20	21		12	23	28
13	12	26	13	20	33		13	23	28
14	12	47	14	20	45		14	23	27
15	13	6	15	20	56		15	23	26
16	13	26	16	21	6		16	23	25
17	13	45	17	21	27		17	23	24
18	14	4	18	21	17		18	23	22
19	14	23	19	21	46		19	23	19
20	14	41	20	21	55		20	23	15
21	15	0	21	21	3		21	23	12
22	15	18	22	22	12		22	23	8
23	15	35	23	22	19		23	23	3
24	15	53	24	22	27		24	22	59
25	16	11	25	22	33		25	22	54
26	16	29	26	22	40		26	22	48
27	16	45	27	22	47		27	22	42
28	17	2	28	22	52		28	22	35
29	17	18	29	22	57		29	22	29
30	17	34	30	22	3		30	22	22
			31	23	32				

North declination. North declination.

1573. The first yeare.

North declination.

Equinoctiall.

South declination.

July.			August.			September.		
D.	G.	M.	D.	G.	M	D.	G.	M.
1	22	13	1	15	23	1	4	39
2	22	5	2	15	5	2	4	16
3	21	56	3	14	48	3	3	53
4	21	47	4	14	30	4	3	31
5	21	36	5	14	11	5	3	7
6	21	27	6	13	51	6	2	44
7	21	19	7	13	33	7	2	20
8	21	8	8	13	13	8	1	58
9	20	57	9	12	54	9	1	34
10	20	47	10	12	34	10	1	10
11	20	35	11	12	14	11	0	48
12	20	24	12	11	53	12	0	24
13	20	12	13	11	33	13	0	0
14	19	59	14	11	14	14	0	24
15	19	46	15	10	54	15	0	47
16	19	33	16	10	32	16	1	11
17	19	19	17	10	12	17	1	34
18	19	5	18	9	50	18	1	58
19	18	56	19	9	28	19	2	21
20	18	37	20	9	7	20	2	44
21	18	22	21	8	46	21	3	8
22	18	9	22	8	24	22	3	32
23	17	53	23	8	2	23	3	55
24	17	37	24	7	39	24	4	18
25	17	22	25	7	18	25	4	41
26	17	5	26	6	55	26	5	3
27	16	49	27	6	33	27	5	27
28	16	22	28	6	11	28	5	50
29	16	7	29	5	47	29	6	13
30	15	59	30	5	25	30	6	36
31	15	41	31	5	2			

October.				November.				December.			
D.	G.	M.		D.	G.	M.		D.	G.	M.	
1	6	59		1	17	26		1	23	3	
2	7	22		2	17	43		2	23	8	
3	7	44		3	17	59		3	23	12	
4	8	6		4	18	15		4	23	15	
5	8	39		5	18	31		5	23	19	
6	8	51		6	18	46		6	23	22	
7	9	13		7	19	1		7	23	24	
8	9	34		8	19	16		8	23	25	
9	9	56		9	19	30		9	23	26	
10	10	18	South declination.	10	19	44	South declination.	10	23	27	
11	10	40		11	19	58		11	23	28	
12	11	1		12	20	10		12	23	28	
13	11	23		13	20	22		13	23	28	
14	11	44		14	20	36		14	23	27	
15	12	5		15	20	48		15	23	26	
16	12	26		16	20	59		16	23	25	
17	12	44		17	21	10		17	23	24	
18	13	7		18	21	21	Solstic.	18	23	21	
19	13	27		19	21	33		19	23	18	
20	13	47		20	21	41		20	23	14	
21	14	7		21	21	51		21	23	11	
22	14	26		22	21	59		22	23	6	
23	14	45		23	22	8		23	23	1	
24	15	4		24	22	17		24	22	55	
25	15	23		25	22	25		25	22	50	
26	15	41		26	22	32		26	22	43	
27	16	0		27	22	39		27	22	36	
28	16	17		28	22	46		28	22	28	
29	16	35		29	22	52		29	22	2	
30	16	52		30	22	57		30	22	13	
31	17	9						31	22	4	

1574. The second yeare.

Iauuary.				February.				March.		
D.	G.	M		D.	G.	M.		D.	G.	M
1								1	3	55
2	21	56		1	14	12		2	3	32
2	21	46		2	13	52		3	3	8
4	21	36		3	13	32		4	2	44
5	21	26		4	13	11		5	2	20
6	21	15		5	12	51		6	1	57
7	21	4		6	12	31		7	1	34
8	20	52		7	12	10		8	1	10
9	20	41		8	11	49		9	0	46
10	20	28		9	11	27		10	0	22
11	20	16		10	11	6		11	0	2
12	20	3	South declination.	11	10	44	South declination.	12	0	25
13	19	49		12	10	23		13	0	49
14	19	36		13	10	1	Equino-	14	1	13
15	19	21		14	9	39		15	1	36
16	19	7		15	9	17		16	2	0
17	18	52		16	8	55	ctiall.	17	2	23
18	18	37		17	8	32		18	2	47
19	18	17		18	8	10		19	3	11
20	18	1		19	7	47		20	3	34
21	17	49		20	7	25	North declination.	21	3	56
22	17	32		21	7	2		22	4	20
23	17	15		22	6	39		23	4	43
24	16	57		23	6	16		24	5	7
25	16	40		24	5	52		25	5	29
26	16	23		25	5	29		26	5	52
27	16	5		26	5	6		27	6	16
28	15	47		27	4	42		28	6	38
29	15	28		28	4	19		29	7	1
30	15	10						30	7	32
31	14	51						31	7	46
	14	31								

North declination.

Apryll. D.	G.	M.	May. D.	G.	M.	June. D.	G.	M.
1	8	9	1	17	46	1	23	6
2	8	30	2	18	1	2	23	11
3	8	51	3	18	17	3	23	14
4	9	14	4	18	32	4	23	17
5	9	35	5	18	46	5	23	20
6	9	56	6	19	1	6	23	23
7	10	18	7	19	14	7	23	25
8	10	39	8	19	28	8	23	26
9	10	59	9	19	41	9	23	27
10	11	20	10	19	54	10	23	27
11	11	41	11	20	6	11	23	28
12	12	1	12	20	18	12	23	28
13	12	21	13	20	30	13	23	28
14	12	41	14	20	41	14	23	27
15	13	1	15	20	53	15	23	26
16	13	21	16	21	3	16	23	25
17	13	40	17	21	14	17	23	24
18	14	0	18	21	25	18	23	22
19	14	18	19	21	34	19	23	20
20	14	37	20	21	43	20	23	16
21	14	55	21	21	52	21	23	12
22	15	13	22	22	1	22	23	9
23	15	30	23	22	9	23	23	5
24	15	48	24	22	17	24	23	0
25	16	6	25	22	25	25	22	54
26	16	23	26	22	31	26	22	49
27	16	40	27	22	38	27	22	43
28	16	57	28	22	45	28	22	36
29	17	13	29	22	52	29	22	29
30	17	30	30	22	58	30	22	22
			31	23	1			

Solstic.

1574. The second yeare.

July.			August.			September.		
D.	G.	M	D.	G.	M.	D.	G.	M
1	22	14	1	15	28	1	4	45
2	22	6	2	15	10	2	4	22
2	21	58	3	14	51	3	3	58
4	21	49	4	14	33	4	3	36
5	21	40	5	14	16	5	3	13
6	21	31	6	13	58	6	2	49
7	21	21	7	13	38	7	2	26
8	21	11	8	13	18	8	2	4
9	21	0	9	12	58	9	1	42
10	20	49	10	12	39	10	1	18
11	20	38	11	12	19	11	0	56
12	20	26	12	11	59	12	0	32
13	20	13	13	11	39	13	0	7
14	20	2	14	11	19	14	0	17
15	19	55	15	10	58	15	0	41
16	19	37	16	10	36	16	1	3
17	19	23	17	10	16	17	1	27
18	19	9	18	9	54	18	1	51
19	18	55	19	9	34	19	2	15
20	18	42	20	9	12	20	2	38
21	18	26	21	8	50	21	5	1
22	18	12	22	8	28	22	3	24
23	17	56	23	8	7	23	3	48
24	17	41	24	7	45	24	4	11
25	17	25	25	7	24	25	4	34
26	17	9	26	7	2	26	4	57
27	16	52	27	6	39	27	5	20
28	16	36	28	6	16	28	5	44
29	16	20	29	5	53	29	6	7
30	16	2	30	5	31	30	6	30
31	15	45	31	5	8			

North declination.

Equino-

ctiall.

North declination.

South declination.

October.

October.				November.				December.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	6	53		1	17	22		1	23	2
2	7	16		2	17	39		2	23	7
3	7	39		3	17	55		3	23	12
4	8	0		4	18	1		4	23	15
5	8	23		5	18	27		5	23	18
6	8	45		6	18	42		6	23	22
7	9	8		7	18	57		7	23	25
8	9	30		8	19	11		8	23	26
9	9	52		9	19	25		9	23	26
10	10	13		10	19	39	Solstic.	10	23	27
11	10	35		11	19	53		11	23	28
12	10	56		12	20	6		12	23	28
13	11	18		13	20	19		13	23	28
14	11	39		14	20	32		14	23	27
15	12	0		15	20	44		15	23	26
16	12	21		16	20	56		16	23	25
17	12	42		17	21	6		17	23	24
18	13	2		18	21	17		18	23	22
19	13	22		19	21	28		19	23	19
20	13	42		20	21	38		20	23	15
21	14	2		21	21	48		21	23	12
22	14	22		22	21	57		22	23	8
23	14	41		23	22	6		23	23	2
24	15	0		24	22	15		24	22	56
25	15	19		25	22	23		25	22	51
26	15	37		26	22	31		26	22	45
27	15	56		27	22	37		27	22	37
28	16	14		28	22	44		28	22	30
29	16	31		29	22	51		29	22	23
30	16	48		30	22	57		30	22	15
31	17	5						31	22	7

South declination. South declination.

1575. The third yeare.

January.			February.			March.		
D.	G.	M.	D.	G.	M.	D.	G.	M.
1	21	57	1	14	17	1	4	2
2	21	48	2	13	57	2	3	38
3	21	38	3	13	37	3	3	15
4	21	28	4	13	15	4	2	51
5	21	18	5	12	56	5	2	27
6	21	6	6	12	35	6	2	3
7	20	55	7	12	15	7	1	40
8	20	44	8	11	54	8	1	16
9	20	31	9	11	33	9	0	52
10	20	19	10	11	12	10	0	28
11	20	5	11	10	51	11	0	4
12	19	52	12	10	29	12	0	20
13	19	39	13	10	7	13	0	44
14	19	24	14	9	45	14	1	8
15	19	10	15	9	22	15	1	32
16	18	56	16	9	0	16	1	55
17	18	40	17	8	38	17	2	18
18	18	24	18	8	15	18	2	41
19	18	9	19	7	53	19	3	5
20	17	53	20	7	30	20	3	29
21	17	36	21	7	8	21	3	52
22	17	20	22	6	45	22	4	18
23	17	2	23	6	22	23	4	3
24	16	45	24	5	59	24	5	15
25	16	27	25	5	35	25	5	24
26	16	10	26	5	12	26	5	47
27	15	51	27	4	49	27	6	10
28	15	33	28	4	25	28	6	33
29	15	13				29	6	56
30	14	55				30	7	19
31	14	35				31	7	40

South declination.

Equinoctiall.

South declination.

North declination.

April.

April.				Maye.				Iune.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	8	1	North declination.	1	17	43	Solstic. North declination.	1	23	5
2	8	24		2	17	59		2	23	10
3	8	46		3	18	14		3	23	13
4	9	8		4	18	28		4	23	16
5	9	30		5	18	42		5	23	20
6	9	52		6	18	57		6	23	23
7	10	12		7	19	11		7	23	24
8	10	34		8	19	24		8	23	25
9	10	57		9	19	38		9	23	26
10	11	16		10	19	51		10	23	27
11	11	36		11	20	3		11	23	28
12	11	56		12	20	15		12	23	28
13	12	17		13	20	28		13	23	28
14	12	37		14	20	39		14	23	27
15	12	57		15	20	51		15	23	26
16	13	16		16	21	1		16	23	25
17	13	35		17	21	12		17	23	24
18	13	54		18	21	22		18	23	22
19	14	14		19	21	32		19	23	20
20	14	32		20	21	42		20	23	17
21	14	51		21	21	51		21	23	13
22	15	10		22	22	0		22	23	10
23	15	27		23	22	8		23	23	6
24	15	46		24	22	16		24	23	1
25	16	4		25	22	24		25	22	55
26	16	22		26	22	30		26	22	50
27	16	38		27	22	37		27	22	44
28	16	54		28	22	43		28	22	37
29	17	10		29	22	50		29	22	31
30	17	27		30	22	55		30	22	24
				31	23	0				

July.			August.			September.		
D.	G.	M.	D.	G.	M.	D.	G.	M.
1	22	16	1	15	30	1	4	54
2	22	9	2	15	13	2	4	28
3	22	0	3	14	56	3	4	5
4	21	51	4	14	49	4	3	41
5	21	43	5	14	20	5	3	18
6	21	33	6	14	1	6	2	55
7	21	23	7	13	42	7	2	31
8	21	12	8	13	22	8	2	8
9	21	2	9	13	3	9	1	47
10	20	52	10	12	43	10	1	23
11	20	42	11	12	23	11	0	59
12	20	30	12	12	2	12	0	36
13	20	18	13	11	42	13	0	12
14	20	6	14	11	23	14	0	12
15	19	57	15	11	2	15	0	36
16	19	40	16	10	41	16	0	59
17	19	26	17	10	20	17	1	23
18	19	13	18	9	58	18	1	47
19	19	0	19	9	38	19	2	10
20	18	45	20	9	17	20	2	33
21	18	30	21	8	56	21	2	56
22	18	15	22	8	33	22	3	20
23	18	0	23	8	12	23	3	43
24	17	45	24	7	50	24	4	6
25	17	29	25	7	28	25	4	30
26	17	14	26	7	5	26	4	52
27	16	57	27	6	43	27	5	16
28	16	40	28	6	20	28	5	39
29	16	24	29	5	58	29	6	2
30	16	6	30	5	35	30	6	25
31	15	49	31	5	14			

North declination.

North declination.

Equino-ctiall.

South declination.

October.

South declination.

October.			November.				December.		
D.	G.	M.	D.	G.	M.		D.	G.	M.
1	6	48	1	17	16		1	23	0
2	7	10	2	17	33		2	23	6
3	7	34	3	17	49		3	23	11
4	7	55	4	18	5		4	23	15
5	8	18	5	18	22		5	23	18
6	8	40	6	18	37		6	23	21
7	9	3	7	18	52		7	23	24
8	9	25	8	19	7		8	23	26
9	9	46	9	19	21	Solſtic.	9	23	27
10	10	8	10	19	35		10	23	27
11	10	30	11	19	49	South declination.	11	23	28
12	10	53	12	20	2		12	23	28
13	11	13	13	20	15		13	23	28
14	11	33	14	20	28		14	23	27
15	11	54	15	20	40		15	23	27
16	12	15	16	20	53		16	23	26
17	12	34	17	21	4		17	23	25
18	12	56	18	21	15		18	23	23
19	13	16	19	21	26		19	23	21
20	13	36	20	21	36		20	23	16
21	13	56	21	21	45		21	23	12
22	14	16	22	21	54		22	23	8
23	14	35	23	22	3		23	23	3
24	14	57	24	22	12		24	22	57
25	15	12	25	22	20		25	22	52
26	15	30	26	22	28		26	22	46
27	15	49	27	22	35		27	22	39
28	16	7	28	22	42		28	22	32
29	16	25	29	22	49		29	22	25
30	16	42	30	22			30	22	17
31	16	59					31	22	8

1576. The yeare Bissextilis.

January.				February.				March.		
D.	G.	M		D	G.	M.		D.	G.	M
1	21	59		1	14	21		1	3	44
2	21	50		2	14	2		2	3	21
2	21	41		3	13	42		3	2	57
4	21	31		4	13	22		4	2	33
5	21	20		5	13	2		5	2	9
6	21	9		6	12	41		6	1	46
7	20	58		7	12	21		7	1	22
8	20	47		8	12	0		8	0	58
9	20	34		9	11	39		9	0	34
10	20	22		10	11	18		10	0	10
11	20	9		11	10	57		11	0	14
12	19	56		12	10	35		12	0	38
13	19	43		13	10	13		13	1	50
14	19	28		14	9	51		14	1	24
15	19	13		15	9	28		15	1	48
16	18	59		16	9	6		16	2	12
17	18	44		17	8	44		17	2	35
18	18	29		18	8	21		18	2	59
19	18	14		19	7	59		19	3	22
20	17	57		20	7	36		20	3	46
21	17	41		21	7	14		21	4	9
22	17	25		22	6	51		22	4	32
23	17	7		23	6	28		23	4	55
24	16	50		24	6	5		24	5	19
25	16	32		25	5	41		25	5	41
26	16	14		26	5	18		26	6	3
27	15	56		27	4	55		27	6	27
28	15	38		28	4	3		28	6	50
29	15	18		29	4	8		29	7	13
30	15	0						30	7	35
31	14	41						31	7	57

South declination.

South declination.

Equino-

ctiall

North declination.

April.

April.			May.				June.		
D.	G.	M.	D.	G.	M.		D.	G.	M.
1	8	20	1	17	54		1	23	8
2	8	41	2	18	9		2	23	12
3	9	3	3	18	24		3	23	15
4	9	25	4	18	38		4	23	19
5	9	46	5	18	53		5	23	22
6	10	8	6	19	7		6	23	24
7	10	29	7	19	21		7	23	25
8	10	50	8	19	34		8	23	26
9	11	11	9	19	48		9	23	27
10	11	31	10	20	0		10	23	28
11	11	51	11	20	12		11	23	28
12	12	12	12	20	25		12	23	28
13	12	33	13	20	37		13	23	27
14	12	52	14	20	48		14	23	27
15	13	12	15	20	58		15	23	26
16	13	32	16	21	9		16	23	24
17	13	51	17	21	20		17	23	24
18	14	11	18	21	30		18	23	21
19	14	29	19	21	39		19	23	18
20	14	47	20	21	48		20	23	14
21	15	5	21	21	57		21	23	11
22	15	24	22	22	5		22	23	7
23	15	41	23	22	14		23	23	2
24	16	0	24	22	22		24	22	56
25	16	18	25	22	29		25	22	51
26	16	34	26	22	35		26	22	46
27	16	50	27	22	41		27	22	39
28	17	6	28	22	48		28	22	32
29	17	22	29	22	54		29	22	26
30	17	39	30	22	58		30	22	18
			31	23	3				

North declination.

North declination. Solstic.

July.				August.				September.		
D.	G.	M		D	G.	M.		D	G.	M
1	22	10		1	15	17		1	4	33
2	22	2		2	15	0		2	4	10
2	21	53		3	14	42		3	3	47
4	21	45		4	14	23		4	3	24
5	21	36		5	14	5		5	3	0
6	21	26		6	13	46		6	2	37
7	21	16		7	13	26		7	2	13
8	21	6		8	13	7		8	1	52
9	20	55		9	12	48		9	1	28
10	20	44		10	12	28		10	1	4
11	20	32		11	12	8		11	0	41
12	20	21		12	11	47		12	0	18
13	20	9		13	11	28		13	0	6
14	19	56		14	11	7		14	0	30
15	19	43		15	10	46		15	0	53
16	19	30		16	10	26		16	1	17
17	19	16		17	10	4		17	1	40
18	19	2		18	9	43		18	2	4
19	18	48		19	9	21		19	2	26
20	18	34		20	8	59		20	2	50
21	18	19		21	8	37		21	3	13
22	18	4		22	8	16		22	3	37
23	17	48		23	7	56		23	4	0
24	17	33		24	7	33		24	4	23
25	17	19		25	7	11		25	4	46
26	17	2		26	6	49		26	5	9
27	16	45		27	6	26		27	5	32
28	16	28		28	6	3		28	5	55
29	16	11		29	5	40		29	6	19
30	15	53		30	5	19		30	6	42
31	15	36		31	4	57				

North declination.

North declination.

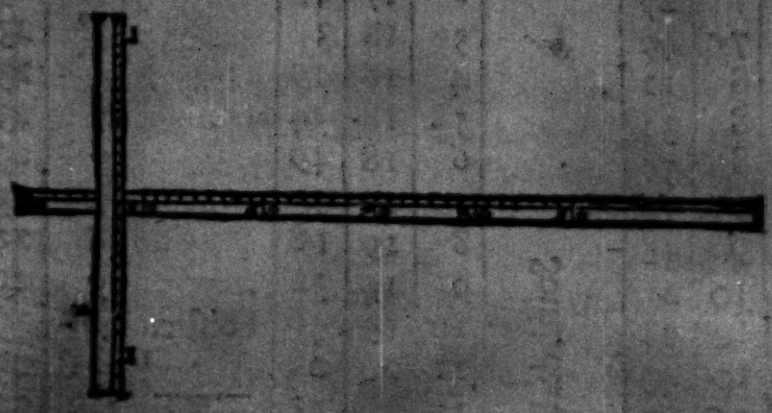
Equino-

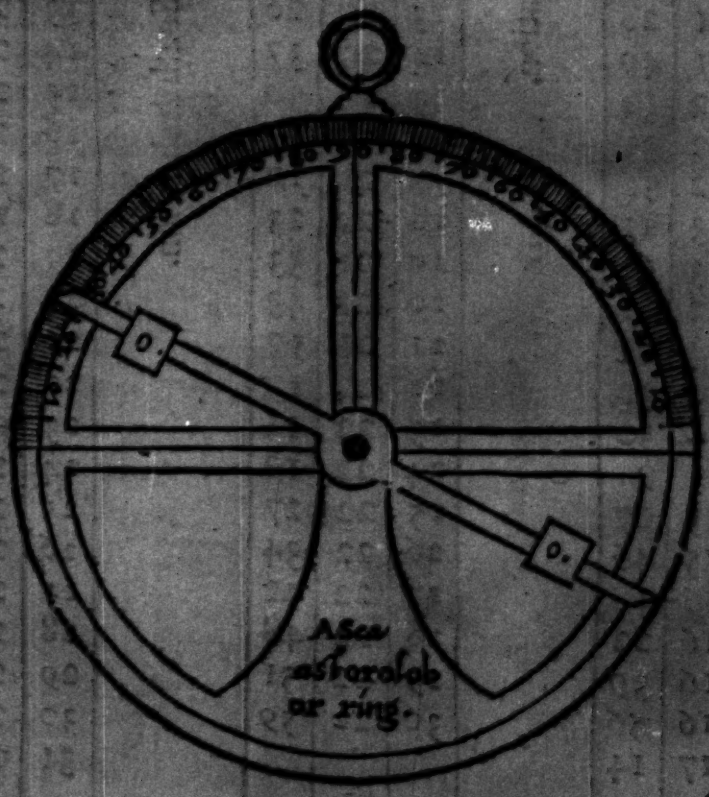
ctiall

South declination.

October.				November.				December.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	7	5		1	17	31		1	23	5
2	7	27		2	17	47		2	23	10
3	7	49		3	18	3		3	23	13
4	8	12		4	18	19		4	23	16
5	8	34		5	18	34		5	23	20
6	8	56		6	18	49		6	23	23
7	9	18		7	19	4		7	23	25
8	9	46		8	19	18		8	23	26
9	10	2		9	19	32		9	23	27
10	10	24	South declination.	10	19	46	Solstic.	10	23	27
11	10	45		11	20	0		11	23	28
12	11	7		12	20	13	South declination.	12	23	28
13	11	28		13	20	26		13	23	28
14	11	49		14	20	37		14	23	27
15	12	10		15	20	50		15	23	26
16	12	31		16	21	1		16	23	25
17	12	51		17	21	12		17	23	24
18	13	11		18	21	23		18	23	21
19	13	31		19	21	33		19	23	18
20	13	51		20	21	43		20	23	13
21	14	11		21	21	52		21	23	9
22	14	30		22	22	1		22	23	6
23	14	50		23	22	11		23	23	0
24	15	9		24	22	19		24	22	54
25	15	27		25	22	27		25	22	49
26	15	46		26	22	34		26	22	43
27	16	4		27	22	41		27	22	35
28	16	22		28	22	48		28	22	28
29	16	39		29	22	51		29	22	21
30	16	56		30	22	59		30	22	13
31	17	14						31	22	4

The Balla Stella, or Crosse staffe: to take the heigth of the Sunne or Starre,





¶ The sixt Chapter or rule sheweth how to take the heigth of the Sunne with the crosse staffe or with the Astrolobe, and also how to find the true Meridian, with other necessary matters.

TO take the true heigth of the Sunne at the Sea, the best way is, to doo it with the crosse staffe: for that the Sea is moueable, and causeth the shippe to heaue, and sette little or much: And also vpon the crosse staffe the degrees bee larger marked than the Ring or Astrolobe: and in a large instrument an errour is seene sooner and better than it is in a small instrument.

How to obserue the Sunne.

Nowe to take the heigth of the Sunne, to knowe the Altitude of the Pole aboue the Horizon, doo this: Firste sette the Sunne with a Compasse, too knowe when that the Sunne commeth neare vnto the Meridian: as soon as you see that the Sunne is come vnto the South and by East, then beginne to take the heigth of the Sunne with the crosse staffe, in this manner: Put the Transitorie vpon the long staffe, then sette the end of the long staffe close at the corner of your eye, winking with your other eye, and remouing the Transitory forwardes or backewardes, vntill you doo see the lower ende of it (being iust with the Horizon) and the vpper ende of it, (being iust with the middle of the Sunne) both to agree with the Sunne and the Horizon at one time: and so haue you the true heigth of the Sunne: this done, still obserue the same, vntil you see the Sunne at the highest, and beginning to discende, and then haue you finished. Yet notwithstanding thys is to be noted: that it is beste to take the heigth of the Sunne with the Crosse Staffe, when the Sunne is vnder fifty degrees in heygthe aboue the Horyzon, for twoo causes. The one is this: Till the Sunne be fifty degrees in heygth, the Degrees bee largely marked vppon the Crosse Staffe,

To take the heigth of the Sunne with the crosse staffe.

The cause why the crosse staffe is best to take the heigth of the Sunne vnto 50. degrees.

but after (the Sunne being aboue. 50. degrees high) they be lesser marked. The other is, for that the Sunne being vnder 50. degrees in heigth, you may easily take the heigth, because you may easily see or viewe the vpper end and the nether end of the crosse staffe both at one time: but if it doth exceede. 50. degrees, then by the meanes of casting your eye vpwardes and downewardes so much, you may soone commit error, and then in like manner, the degrees be so small marked, that if the Sunne dooth passe. 50. or. 60. degrees in heigth, you must leaue the crosse staffe, and vse the Mariners Ring, called by them the Astralaby, which they ought to call the Astrolobe. Now to take the heigth of the Sunne with the common Ring or Astrolobe, doo thus: The Sunne being (as before is declared) neare the Meridian or South, obserue it (vntill you haue the greatest heigth thereof) in this manner: Holde the Ring of the Astrolobe vpon one of your fingers, and turne the Alhidada vppe and downe, vntill you see the shadowe of the Sunne pearse or passe thorough both the sightes thereof, being sure that the Astrolobe dooth hang vpryght, which you may proue in this manner: Looke at howe many degrees and minutes the Alhidada dooth stande vppon the Astrolobe, then turne the Alhidada vnto the same number of the degrees and minutes on the other side of the Astrolobe, and then taking the heigth of the Sunne agayne, if it doo agree as it did before, then the Astrolobe dooth hang vpryght: but if it doo not, then it dooth not hang vpright. For knowledge of the true heigth of the Sunne (the Astrolobe not hanging vpright) doo thus: if the Astrolobe be truely marked, marke the diuersitie, that beeing knowne, rebate from the greatest heygth halfe the diuersitie, or else adde vntoo the lesser heigth, halfe the diuersitie, and that shall bee the true heigth of the Sunne, although that the Astrolobe dooth not hang vpryght.

To take the heigth of the Sunne with the Astrolobe.

How to correct your Astrolobe if it dooth not hang vpright.

The Astrolobe is best

The Astrolobe is best to take the heigth of the Sun, if the Sun be very high at. 60. 70. or. 80. degrees, and the cause is this:

this: the Sunne comming neere vnto your Zenith, hath great power of lyght, for to pearce the .2. sights of the Alhydada of the Astrolobe, and then it is not good to vse the crosse staffe, for that the Sunne hurteth the eyes of a man, and besides that it is to heigh to occupy the crosse staffe, (as before is declared) so that this way you may very much preserue your eyes. If you haue not glasses vpon your staffe (to saue your eyes in taking the heigth of the Sunne) but be vnprouided of them, doo thus: take and couer the Sunne with the end of the transitory of the crosse staffe, vnto the very vpper edge or brinke of the Sunne (so shall you not neede to beholde the brightnesse of it) and with the other ende of the transitory to take the Horizon truely, and that being doone, for that the Sunne is .30. or .31. minutes in Diameter or breath, therfore you shall rebate .15. minutes from the altitude or heigthe of the Sunne, and then that which shall remayne, shall be the true heigth of the Sunne, from the center or middle of the Sunne. And furthermore, there is some error in the taking the Sunne or Starre with the Ballastel or crosse staffe, and that groweth by this meanes: for that the true center (which is the sight of the eye) is within, in the middle of the eye, and not in the outside of the eye: so that the end of the long staffe in the setting of it vnto the corner of your eye, dooth stande somewhat further out than the sight of your eye, that is too saye, that the sighte of the eye is somewhat further intoo the heade, than the ende of the staffe dooth come: wherefore you must pare awaye a little of the ende of the Staffe, for some mens eyes more, and some mens eyes lesse, for that it is according as you may set the staffe vnto your eye, for some men needs pare away little or nothing, and some men must pare away .14. or .15. minutes as you may set the staffe: bycause some mens eyes be further into their head, than other some mens are, and the bones of some mens face stande further out than other some doo. It is moreouer conuenient to knowe the true Meridian, or South, which you must doo, eyther with a

to take the heigth of the Sunne at 60. 70. or 80. degrees in heigth.

How to preserue your eyes when you touch the Sunne with the crosse staffe, and haue no glasses.

The Diameter of the Sunne is 30. or .31. minutes.

Some error in the crosse staffe and how to reforme it.

To get the true Meridian vppon the Land.

good compasse, or with a perfite Dial or Needle: but if you be on the land, this you may do: on a peece of timber, or any other thing that standeth fast, with a payre of compasses make a circle, then in the middle or center where the foote of the compasse did stande, set a wyre vpryght (as circumspectly as you can) and then you may doo this: looke in the morning (so it be on plaine ground, that you may see the Horizon circle, without any let at the Sunne rysing, for the shadowe of the wyre, and there set a pricke: then at the setting of the Sunne you shall set another pricke, euen at the circumference of the circle, then diuide that with your compasses euen in .2. peeces, and strike a straight line from the wyre or center of the circle, to the middle or diuided prick, & that shall be true meridian. Or else the (wyre standing vpright) first in the fore noone when the top of the wyre dooth touch, or is ready to come into the circumference or edge of the circle, there make a pricke: then in the after noone in like manner at the very comming out or touching of the wyre, of the edge of the cicle, there make an other pricke euen with the comming out of the shadowe: this done (as circumspectly as you can) diuide these 2. prickes in the middle, then as before is said, draw a line frō the center or wyre to the middle pricke, and that shadow shall be your true meridian. After another manner you maye doo this: looke and watch when the wyre giueth the shortest shadowe, and there make a pricke, then drawe a line from that pricke to the wyre, which shadow shall be the true meridian.

To knowe the true meridian at the Sea, and also (if your compas be varied) and to know how much they be varied.

And yet furthermore, for that it is most cōuenient to know the true Meridian at the Sea, bycause in long viages going far into the Weestward or Eastward, the compasse dooth varye: to finde the true Meridian doo this. Set the Sunne with your compasse at hir rising or appering aboue the horizon, and then (knowing what poynt & parte the Sunne dooth rise at) set the Sunne with your compasse at hir setting or departing vnder the horizō, & (that being known) you shal perfitly know, whether the cōpasse be varied, & how much: for ensyple this, I do

set

set the Sun at hir rising with the compas, & she doth rise vpō the East poynt: in like maner also I do set the Sun with hir compas at hir setting, & do find hir to set West Northwest: so I do see the compas to be varied one poynt, that is to say, the North point doth stand North and by East. &c. And furthermore (for that seldome times the Sun dothe rise and set cleere by the meanes of the cloudes, and other impediments neere the horizon) you may get the true Meridan thus: at any time in the fore noone, first set the Sunne with your compas, and then take the true heigth of the Sunne. Now you (knowing how many degres the Sun was high at that point of the compas) may in like maner obserue the Sunne in the afternoone, vntill you do find the Sun iust at that heigth that it was in the forenoone, marking at what point of the compas the Sunne is, and so shall you see perfitely whether the compas be baried or no, and also howe much: for ensample thus: I take the Sun vpon the Southest poynt. 20. degrees aboue the horizon, and then in the afternoone I do obserue the Sun vntil such time as I do find the Sunne iust. 20. degrees aboue the horizō again, & thē I set the Sun with the compas, & do find the Sun to be at. 20. degrees in heigth west Southwest, so that I see the compas to be baried one point, that is to say, the North point doth stand North & by East. &c. Another way also to know the true meridian, is by the Sun: that is, to set the Sun with the cōpas at hir greatest heigth aboue the horizon, & so you shall know whether the cōpas be baried, & how much: & loke what is spokē of the Sun by day, you may do the like by night by any of the starres that you perfectly do know, doing as you do by the sun in al points: but you cānot do it so wel & truly by the moone, by the meanes of the swiftnesse of the moones motiō in the Zodiack, you may also find the variation of the cōpas, by the north starre, as thus: set the north star with the Compas, if the North point do stande right with the Starre, then it is not baried, but if it doth not stande right with the Starre, then it is baried: and that must

To find the variation of the compasse in the nighe by the starrs, but not by the moone.

be

be done when the. 2. Starres of Charles Wayne called the poynters, be right vnder, or right ouer the North Star, but if that the Starres be west from the North Starre, then the North Starre is the third part of a poynt vnto the Eastward of the North Pole. If the two Starres of Charles wayne, called the poynters, be due East from the north Starre, then the north Starre is the thyrd part of a poynt vnto the Westward of the north Pole. &c. This haue I said, bicause that sometyme in sundry places, the Compasse doth varie, & especially in the sayling of long viages runnyng East and West, (called the Northeastyng or northwesting of the Compasse) therfore I would not wish them to meddle with the mending of their Compasse, or whettyng of the side of the needle, to the end to make it stand due North, but circumspectly to awayte the alteryng of the Compasse, and what quantitie it dooth alter: as you may doo very well, by the order before rehearsed, and then let your Compasse alone: for although that it doth varie. 2. or. 3. poyntes, you may make account accordyng to the variation: as thus, I admit the northwest poynt standeth due north, and my course is to goe due west, I wyll occupye the Southwest poynt in this case for the West poynt. And thus (by obseruation and tryping of my Compasse) I care not what poynt standeth due north, for it is all one, so that you consider what poynt standeth north. And nowe furthermore, some are of that opinion, that (by the northeastyng or northwesting of the Compasse) you may knowe the Longitude: but I am not of that opinion, for I admyt that it be so (as some doo affirme) that the Compasse doth varie, (as some haue said) that is, that you being. 90. degrees vnto the westwarde (from the place your Compasse was made at) your north poynt shoulde stande northeast: and in like manner you being. 90. degrees East, your north poynt shoulde stande northwest: then by that order the Compasse should varie one poynt at. 22. degrees and a halfe, and that commeth vnto. 450. English leagues (if you be neere vnto the Equinoctial: wherfore

Wedell not with your compasse although it be varied.

To saile by the compas that is varied.

As touching Longitude to be founde by the North. eastling or Northwesthyng of the Compasse.

no

no maister or pilot of a shippe, doth keepe so simple account of the shippes way, but that he may knowe what distance he hath vnto any place, better thā he shal know by the varying of the compas: & also whether it be so or not, that the compas doth keepe any such proportion in the variatiō, I do refer that vnto them that haue tryed the experience therof: for I for my part can say nothing in that matter. Wherfore I ceasse from writyng muche thereof, although the Sea men bee very desirous to haue some way to get the Longitude. But if it be true, that the compasse doth vary by that proportion, then it were very good for them too practyse that matter that shoulde make any discouery vnto the Northwardes, for that the degrees be so short in those Paralels.

The seuēth Chapter sheweth how to handle the declination of the Sunne to knowe the altitude of the North pole aboue the horizon, (the heigth of the Sunne being truely taken and knowen in any place betweene the North pole and the Equinoctiall) so that the Sunne be vnto the Southwards of you, at the taking of the Sunne vpon the Meridian.

YOu must consider by the regiment or table of declinatiō (going before) that the. 11. day of Marche the Sun is equinoctiall entring then the first point of Aries (called the equinoctiall of spring time) where she hath no declination. The. 10. day of Aprill the Sunne entreth into the first minute of Taurus, then hauing declination to the Northwards, 11. degrees. 30. minuts. The. 12. day of May, the Sunne entreth the first pointe of Gemini, hauing then declination. 20. degrees. 12. minuts. The. 12. day of June the Sunne entreth into Cancer, where he (making his greatest progresse to the Northward) The greatest declination of the Sun.

Northwards) hath. 23. degrees. 28. minuts of declinatiõ. But now in this our tyme, some do affirme it to be. 23. degrees and a halfe, but it lacketh. 2. minuts. The. 14. day of Julie, the Sunne entreth into Leo comming downwarves to the Equinoctial, hauing. 20. degrees. 12. minutes of declination. The 14. day of August the Sunne entreth into Virgo, hauing declination. 11. degrees. 30. minuts. The. 14. of September, the Sunne entreth into Libra, (then being Equinoctiall, and hauing no declinotion) which is called the Equinoctiall of Autumme or harueſt, where he beginneth his South declination. The. 14. of October the Sun entreth into Scorpio, where his declination is. 11. degrees. 30. minuts. The. 12. of November the Sun entreth into Sagittarius, his declination being. 20. degrees. 12. minuts. The. 12. day of December, the Sunne entreth the firſte minute of Capricorne, where the Sun (making greateſt progreſſe to the Southwards) hath of declination. 23. degrees and. 28. minuts. From whence he returneth to the Equinoctiall againe. The. 11. of January the Sunne entreth into Aquarius, where his declination is 20. degrees. 12. minuts. The. 10. day of Febuary the Sunne entreth into the firſt minute of Piſces, and hath of declination. 11. degrees. 30. minuts. The. 11. day of March, the Sun retourneth to the ſelfe ſame place that it departed from before, wherefore the Egiptians did paint the yeare like to an Adder biting hir tayle, and (not hauing the vſe of letters) they made a ring, and named it annulus, as it were annus, that is to ſaye, a yeare: bycauſe a ring doth turne rounde in it ſelfe as dothe the yeare. The heigth of the Sunne beeing knowen, you (knowing the day of the mooneth, and what yeare it is after the Biſſextilis) muſt turne to the day of the mooneth, in the regiment or table going before, where ryght againſt the day of the mooneth you ſhall find the degrees of declination, and the odde minuts belonging to the degrees of declination following: that being knowen (that is to ſay, the heigth of the Sun with the degrees and minuts of the declination)

Equinoctial of Autumme.

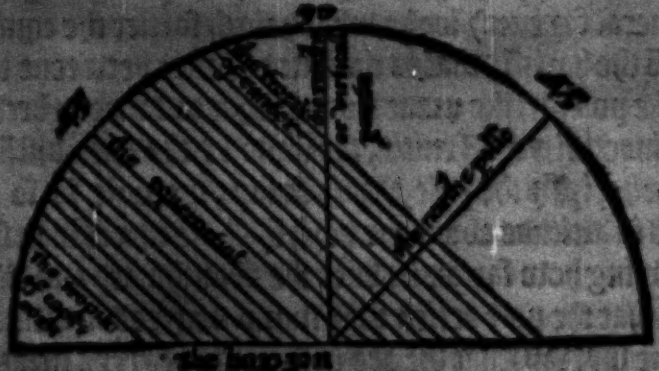
The greateſt declination to the ſouth.

The yeare is compared vnto a ring or an adder biting hir tayle.

nation) if the Sunne haue North declination, you shal subtract or take away the Sunnes declination from the heigth of the Sunne, with the degrees and minutes: and then that which remayneth, shal be the true heigth of the Equinoctiall: which being knowen, pulling that summe out of. 90. with the degrees and minutes, that which doth remayne, shal be the true heigth of the North Pole aboue the Horizon. But if that the Sunne hath South declination, you shal adde or put that declination vnto the heigth of the Sunne, which shall shewe vnto you the true heigth of the Equinoctiall: of the whiche summe (being taken from. 90.) that which dooth remaine, shalbe the altitude of the North Pole aboue the Horizon. For this is to be noted: looke what heigth the Equinoctial is aboue the Horizon, it is equall or iust so muche betweene the Zenith or vertical poynt and the North Pole. In like maner, looke how many degrees and minutes are betweene the Equinoctial and your Zenith, iust that number of degrees and minutes is from the North Pole, downe to the Horizon, which is the cause that you must pul the heigth of the Equinoctiall from the Horizon, with the degrees and minutes. For that your Zenith is alwayes. 90. degrees from the Horizon, as you see by this figure.

The heigth of the Sun being taken and knowen then how to handle the declination to knowe the heigth of the pole.

Things to be noted as touching the taking of the altitude of the pole.



H.ii. The

The .8. Chapter sheweth you how to handle the declination of the sunne, when you are betwene the Equinoctial and the Sunne: that is to say, the Sunne being to the Southwards or Northwards of you and the Equinoctiall, or vnder the Equinoctiall: the heigth of the Sunne being truely knowen or taken.

NOw furthermore if you be vnto the South parts neare vnto the equinoctiall, so that the Sunne haue any great declination either to the Southwards or the Northwards, you being betweene the equinoctiall and the Sunne, whē you haue taken the true heigth of the Sun with the Astrolobe to know the heigth of any of the .2. poles do this: seeke the declination of the Sun for that day with the degrees & minuts, the declinatiō being knowen & the height of the Sū in like maner, thē adde the declinatiō of the Sun vnto the height therof, & it wil exceede or be more than .90. degrees, thē again looke how many degrees it is more than .90. with degrees & minutes, that shall be the true heigth of the pole towards that side that the Sun is: bycause the equinoctial is the number of degrees aboue .90. (which is your Zenith) to the contrary part frō the Sunwards. For (as I haue sayd in the chapter going before, & is general for euer) looke what heigth soeuer the equinoctial be frō the horizō, that is the true distance betweene the Zenith & the pole: in like maner looke what distance is betweene the equinoctial & the Zenith, the same is the true distāce betwen the horizō & the pole, that is to say, the pole is so many degrees in altitude aboue the horizō. As it is a cōmon saying (in knowing how far we be vnto the Southwards or Northwards) that the pole artick is so many degrees in altitude, or (as some wyl say) that we are in so many degrees in latitude: the question is al one in effect, although the one be called Altitude or heigth, and the other Latitude or wideneſſe, yet it hathe one signification: for as when you saye altitude, or heigth

A thing to be noted.

Altitude or Latitude is all one question in effect.

heigth of the Pole, you meane the Pole is rayſed ſo many degrees aboue the Horizon. So likewyſe when you ſay Latitude, you mean you be ſo many degrees in wydeneſſe frō the Equinoctiall: for that your Zenith or verticall poynt is ſo many degrees frō the Equinoct. Moreouer if you chaunce to be right vnder the Equinoctial, as you cānot ſay that you haue any Latitude, ſo likewyſe cannot you ſay that you haue any Altitude, for that the two Poles be then iuſt with your Horizon, and in like maner the Equinoctiall is your Zenith or Verticall point. But when you will take the heigth of the Sunne with your Aſtrolobe, then looke what declination the Sunne hath, eyther to the Southwardes or Northwardes. Then put the declination of the Sunne vnto the heigth of the ſame, and the number will be iuſt. 90. degrees: if it lacketh any thing of. 90. degrees, then it ſignifieth that the Equinoctiall lacketh ſo much of the Zenith, and ſo muche iuſt ſhal the pole be aboue the Horizon towards that part that you be in from the Sunne wardes. But contrariwyſe, if it dothe exceede or be any thing more than. 90. degrees, then (as afore is declared) it ſignifieth that the Equinoctiall is as much as that number (both in degrees and minuts.) On the contrary ſide from the Sunnewardes, that is to ſay, your Zenithe ſhall be betweene the Sunne and the Equinoctial, & the Pole ſhall be ſo many degrees or minutes aboue the Horizon, as is the diſtance betweene the Zenith and the Equinoctiall, towardes that part or ſide that the Sunne is on. Wherefore I do thinke it neceſſary to giue certaine enſamples (and firſt take this for an enſample.) Admit I doe take the heigth of the Sunne vnto the Northwardes. 80. degrees aboue the Horizon, and the Sunne hathe declination vntoo the Northwardes. 20. degrees, to which I adde or put the heigth, that is to ſay. 80. degrees (being the heigth of the Sunn) and. 20. degrees (being the declination of the Sunne) doe mak. 100. frō which I pull. 90. away (which is my Zenith) and ſo there remayneth. 10. degrees. Wherefore you may conclude, that the

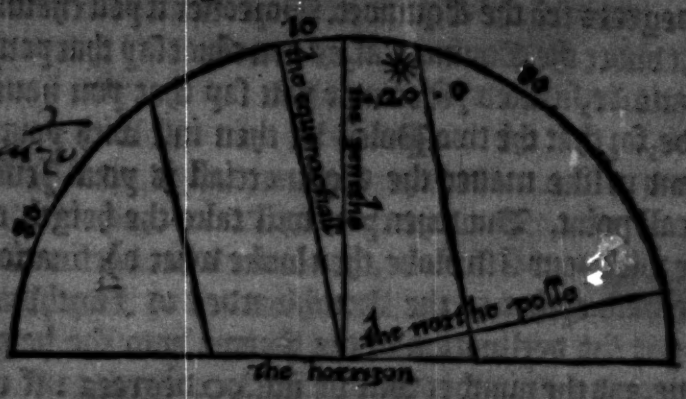
Being vnder the Equinoctiall, you haue neither latitude nor altitude, for that the Equinoctial is your Zenith, & the Poles your Horizon.

Of your Zenith being betweene the Equinoctial & the Sunne

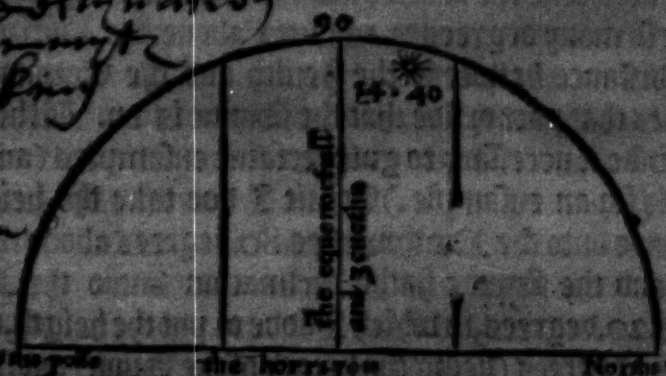
An enſample

An example where the pole is .10. degrees aboue the horizon.

Equinoctiall is.10.degrees to the South parte of your Zenith, and the Sunne to be.10.degrees to the North parte of your Zenith, so that the North Pole is.10.degrees aboue the Horizon, as by example it is declared.



And for the second ensample, admit I take the Sunne vnto the Northwardes.75.degrees and.20.minutes aboue the Horizon, the Sunne hauing North declination.14.degrees 40.minuts, I then doo adde or put.14.degrees.40.minutes vnto.75.degrees.20 minuts, and those.2.ioyned togither maketh.90.degrees, whereof you may conclude, that the Equinoctiall is your Zenith, and then the.2.Poles be with your Horizon, as by this example it doth appeare.



And now followeth the.3.ensample. I admit the Sunne be taken with the Astrolobe.81.degrees and.15.minutes aboue the horizon, and the same hath the South declination.22. degrees

degrees.35.minuts, wherefore I do adde or put togither.81. degrees and.15.minuts (being the heigth of the Sunne) and 22.degrees.35.minutes (being the declination) and that maketh.103.degrees.50.minuts: from which I take away.90. degrees (which is my Zenith) so that there remayneth.13.degrees.50.minutes: so that you may safely conclude, that the Equinoctiall is.13.degres.50.minuts vnto the North parts of the Zenith, and then it muste needes follow that the South pole is.13.degres.50.minuts aboue the Horizon, as by this ensample it is declared. An ensample.

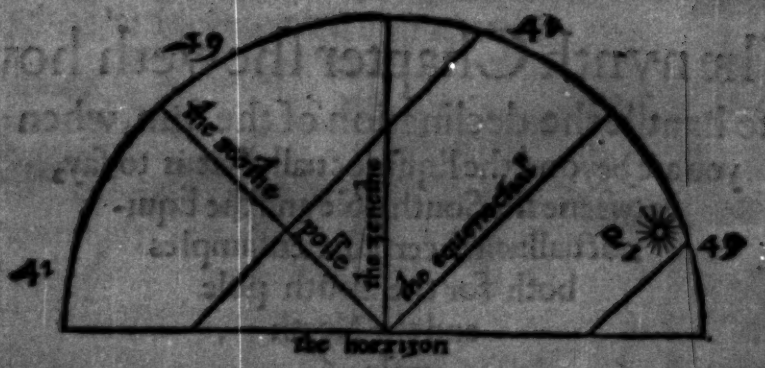
The nynth Chapter sheweth how to handle the declination of the Sun, when you are beyond the Equinoctiall, that is to say, betweene the South pole and the Equinoctiall: with certaine ensamples both for the South pole and the North pole.

AND furthermore, if you be vnto the southwards beyond the equinoct. as betweene the tropick of Capricorne & the south pole, thē to vse the declinatiō of the Sunne to know the heigth of the South pole or antartick pole by the heigth of the Sun, there

To take the Sun to the Northward you being betweene the South Pole and the Equinoctiall.

there is no other matter in the vsing therof, but whereas we (being vnto the North parts) do adde the South declination vnto the heigth of the Sunne, and rebate the North declination from the heigth of the Sunne, so in lyke maner the contrary is to be vsed: that is to say, to rebate the South declination from the heigth of the Sunne, and too adde vntoo the heigth of the Sun the North declination. As for ensample. I admit the heigth of the sun be take. 28. degrees aboue the Horizon due North, & the declination of the Sun be. 21. degrees vnto the Northwards, I do the adde the declination of the sun which is. 21. degrees vnto the heigth of the sun (being. 28. degrees) which maketh. 49. degres, & so many degrees the equinoct. is aboue the Horizon vnto the Northwards, & then (as it is before declared) pull that sum out from. 90. degrees, and there remaineth. 41. degrees, which is the distance betweene the Zenith and the Equinoctiall, whiche alwayes is equall with the distance betweene the Pole and the Horizon: so that you may conclude the South Pole to be rayzed. 41. degrees aboue the Horizon. As by this figure it is shewed.

An ensample by taking the South pole 41. degrees aboue the Horizon.

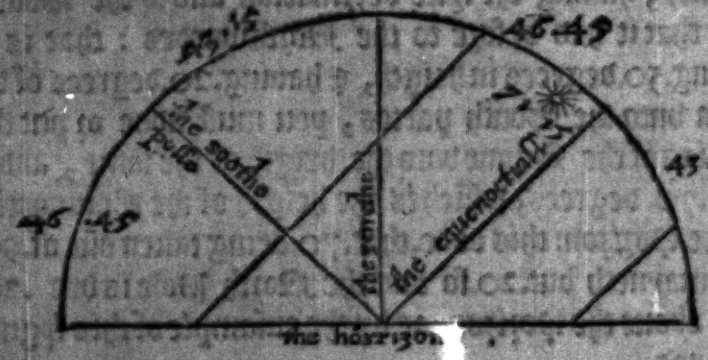


And furthermore, if the Sunne haue South declination, then (as before is declared) you must subtract or take away the Sunnes declination from the heigth of the Sunne: as for ensample. The heigth of the Sunne being taken at. 50. degrees. 30. minuts vnto the North partes, and the Sunne

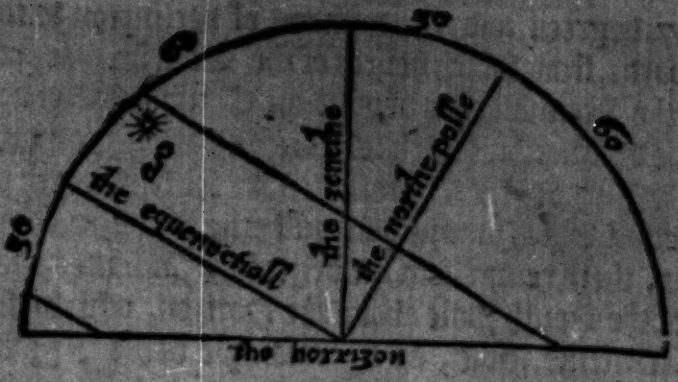
hauing

hauing .7. degrees and .15. minutes of declinaton vnto the Southwards, from which heigth of the Sun (for that you are vnto the the Southwardes beyond the Equinoctial) you muſt rebate the declination which is .7. degrees and .15. minutes, & there reſteth .43. degrees .15. minutes, for the true heigth of the Equinoctiall, which ſumme you muſt take out of .90. degrees, that done, there remayneth .46. degrees .45. minutes, the true heigth of the South Pole aboue the Horizon, otherwyſe called the Antarctike Pole, as by enſample of his Fygure is playnely ſhewed.

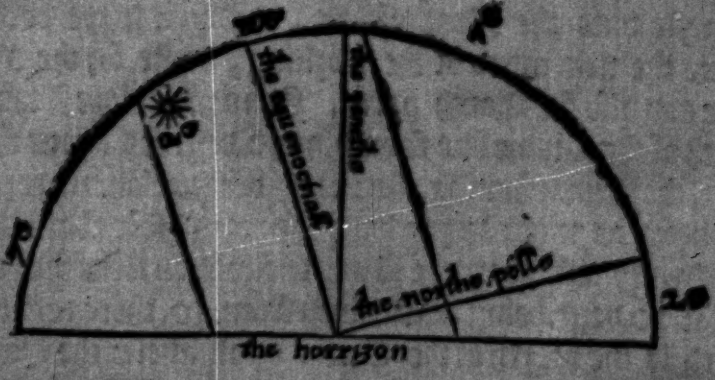
An enſample by taking the North pole .60. degrees aboue the Horizon.



Yet furthermore I do thinke it conuenient to giue you an enſample vnto the Northwards, that you maye perfectly knowe the true order of the working, bothe for the North parte and alſo the South parte. Admit therefore I take the heigth of the Sunne due South, at .50. degrees aboue the horizon, the Sunne hauing then north declination .20. degrees: Now (for as much as you haue the north Pole aboue the horizon) you muſt rebate the Suns declination from the heigth: ſo that .20. degr. being taken away from .50. there reſteth .30. which is the heigth of the Equinoctiall aboue the Horizon, and that .30. being taken from .90. there reſteth, 60. So that you may boldly affirme the North Pole to be .60. degrees aboue the Horizon, as by this figure following it is ſhewed.



In lik maner the Sunne being taken at that heigth and due South, hauing the lyke declination also to the Southwardes that it had before to the Northwardes: that is to say, being.50.degrees in heigth, & hauing.20.degrees of declination vnto the South partes, you must adde or put the declination of the Sunne vnto the heigth of the same, and it maketh.70. degrees, which is the heigth of the Equinoctial aboue the Horizon: this done, that.70.being taken out of.90. there remayneth but.20.so that the North Pole is but .20. degrees aboue the Horizon, as by the ensample of this figure it is shewed.



For in handling of the declination the true heigth of any of the Poles is knowne. Alwayes hauing this consideration, that if they haue the North Pole aboue the Horizon, they do alwayes

alwayes adde or put too the heigth of the Sun, the South declination of the same. Or the Sunne hauing North declination, they put away the Sunnes declination from the heigth therof. Nowe contrarywyse, if the South Pole be aboue the Horizon, you must adde the North declination vnto the heigth of the Sunne, and take away the South declination from the heigth of the same. Nowe to knowe which of the 2. Poles be aboue the Horizon, is a very easie matter, and is knowne .2. wayes. For first if the North Pole be aboue the Horizon, you may knowe it by all the Starres rounde about the Pole, as Charles Wayne and the Guardes, with such other markes as be about the North Pole. Neyther can you passe so sodenly beyond the Equinoctiall, but it must needes be known vnto you, and then you must vse that kinde of working with the Sunnes declination, that in the chapter or rule before is rehearsed: and also you may knowe it by the Arke or bearing of the Starres and lyghtes rounde aboute you. Thus much haue I sayd as touching the Sunnes declination, bycause I knowe that diuers English men would haue trauelled further beyond the Equinoctial than they haue done, but that they haue not had the capacitie to handle the Sunnes declination when they haue bene beyonde the Equinoctiall, that is to say, vnto the South partes, hauing lost the markes about the North Pole, as the North Starre and other, and as for the Starres of the South, they haue not bene acquainted with them, but haue beaten vp and downe alongst the coast of Ginnie and Bymey, and there haue spoiled and consumed their men through the extraordinarie heate of the Sunne, not knowing that in going further to the South partes, they shoulde haue brought themselues into a good temperate clymate againe.

A thing to be noted in the handling of the Sunnes declination.

Howe to knowe whiche of the .2. poles be vnder the horizon.

The cause why english men haue not trauelled far beyond the Equinoctiall.

An vntemperat place for extreme heate. Temperate clymate.

¶ The.10. Chapter sheweth, howe to handle the Sunnes declinaiō vnto the Northvvards, vvhere the Sun doth not set vnder the Horizon, and also to take the Sunne at the lovvest being due North.

For further vse of the Sunnes declination, if you haue any occasion to trauell vnto the Northwardes or Southwardes more then.67. degrees of Altitude of any of the.2. Pols, or if the the sunne haue any great declination vnto those partes that you are in, thē shall not the Sunne go down vnder the Horizon in a long time, after as you be in distance vnto the North parts, for if you were right vnder either of the.2. Poles of the world, then would not the Sunne go vnder the Horizon in halfe a yeare, so that there should be continually day: And now for the handling of the Sunnes declination, to knowe the heigh of the Pole, & to take the Sune North at the lowest, do this: First with your crosse staffe obserue the Sun at the lowest, taking the true distance betweene the Horizon and the Sunne, that being truely done, looke what declination the Sunne hath, then haue you to consider, that except the Sunne be neare vnto hir greatest declination, that is to say, in the latter end of Gemini (or the beginning of Cancer) the Sunne dothe declyne little in.24.houres: but if the declination be very swift, you must seeke the Sunnes declination vpon the day before, and the day after, halfe the diuersitie of which shall be the Sunnes declination: for that the sunne is at the angle of mydnight. The Sunnes true declination being knowne, rebate the heigh of the same from the declination of the Sunne, & so shal you haue the true contente in degrees and minutes, that the Equinoctiall is vnder the Horizon due North, and then pulling that sum from.90. that which remayneth, shal be the heigth of the pole aboue the Horizon: for (as it is before declared) looke what heigth the Equinoctial is aboue the Horizon, that is equall the distance betweene the Pole and the Zenith, and looke what distance

is be-

Of being vnder either of the poles.

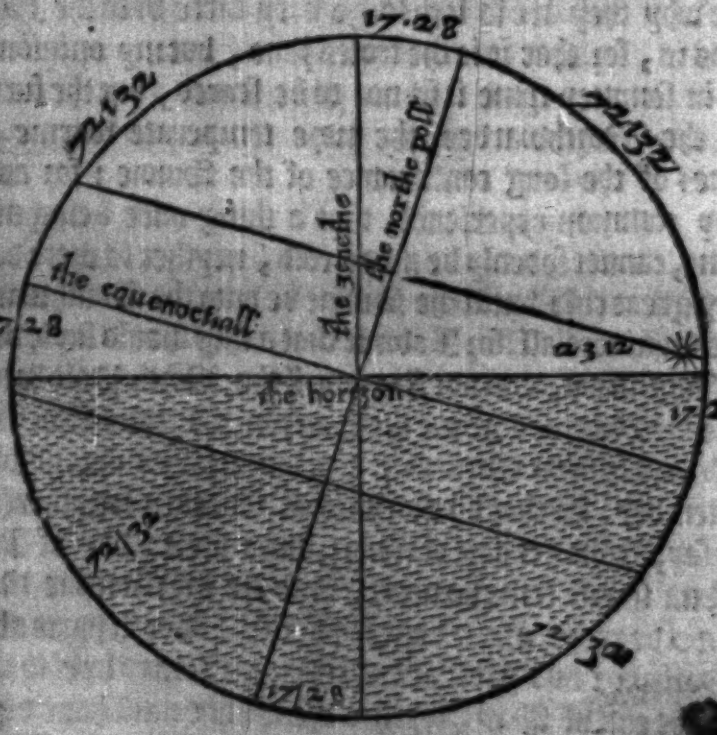
Of taking the heigth of the sun one north at the lowest.

A thing worthy to be noted, touching the Sunnes declination.

is betweene the Equinctiall and the Zenith, the same distance is betweene the Pole and the Horizon: in lyke manner, looke howe deepe vnder the Horizon the Equinoctiall is vnto the Northwards, so far equall is the heigth of the Equinoctiall vnto the Southwards. As for ensample: admit I were vnto the Northwards of the North cape, the Sun being in hir greatest declination vnto the Northwards, which is about the.11.day of June.23.degrees and neere a half: this being knowen, I take the Sunne due North at the lowest, iust.6.degrees aboue the Horizon, the declination being.23. degrees and.28.minutes. Wherfore I rebate from that.6. degrees, and so there remayneth.17. degrees & .28. minutes. For the depth of the Equinoctiall vnder the Horizon, and then do I pull that summe from.90 and there remayenth 72.degrees.32.minutes for the true heigth of the North pole aboue the Horizon, as by this ensample it is declared.

A thing to be noted of the pole and the Equinoctial the Zenith, & the Horizon.

The Sunne taken due North at. 6 degrees.



By this ensample you may also knowe the true heigth of any of the.2.poles, and how to obserue the Sunne at the lowest, when the Sunne commeth neerest vnto the Horizon, as well as you may when the Sunne is vpon the Meridian at the greatest heigth from the Horizon, which is very necessarye for them that do occuppe vnto the Northwardes of Sainct Nicholas in Nouley, it is also very necessary for them that would attempt any viages of discouery vnto the Northwards, as into the East by Noua Zemla, or to the west by cape de paramantia, on the backe side of the North part of the taile of America, otherwyse called the backe side of Vacula, which if it were attempted, there is no doubt but they should finde it nauigable eyther to the East parte, or to the West part: and I am of this opinion, that the thing moste feared in making their discouery vntoo the Northward, deserueth not so greatly to be feared as they do make it, the cause why they are so loth to goe so farre vnto the Northwards is, for that it is the frosen zone, but my opinion is, that in sommer tyme it is not to be feared, but the further vnto the Northwardes, the more temperate warme, by meanes of the long continuance of the Sunne: for as we see by common experience, that a thing once being made warme, cannot sodenly be made cold, neyther is there doubt of any great cold vntill the Sunne be vnto the South wardes of the Equinoctiall: for I admit that a ship should sayle vntoo the Northward, and not stay vntill the North Pole were elenated.80.degrees aboue the Horizon, I do thinke then they should find it very temperate and warme vnto the middle of September, for that by the space of.9.weekes togyther (that is to say, from.10.day of May, vnto the.12.day of July) the Sun should come no neerer vnto the Horizon due North than.10.degrees, or.30.degrees vnto the South parte aboue the Horizon: and yet it is possible that it may be cold there vntill the end of May, for that the Sunne must haue a tyme to make the aire warme, For like as a thing once beeing cold

Of viages for discouery to the Northwardes eyther to the Eastward by Noua Zemla, or to the West ward by cape de paramina

Of temperatenesse the pole being rayled .80. degrees

cold, cannot bee sodaynely made warme, so in lyke manner a place being once made warme, cannot bee sodaynely made cold. And furthermore he that were in the Latitude of .80. degrees, shoulde haue but a short paralel: for the whole compasse of the earth and Sea going East and West too come rounde about to that place agayne in the same paralel, is but .1250. englishe leagues, euery league conteyning .3. englishe myles: So that in sayling of lesse than .500. or .600. leagues, they myght see whether it were nauigable or not.

The length of the paralel .80. degrees is but 1250. englishe leagues.

¶ The eleuenth Chapter dooth shew how you shall know the length of the day, and to knowe how much the day is shortned or lengthned by the Sunnes declination

Nowe I thinke it conuenient for Seafaring men too knowe the length of the daye in anye place that they haue occasion too go vntoo: for that they haue occasion too trauell intoo all the climates and places, transporting them selues manye tymes quickly from one place vntoo another: and although the auncient writers haue appoynted certayne climates, and other late wyteres in lyke manner haue made tables very exact for the longest or shortest daye in anye of those climates, and other places, according to the eleuation of the Pole: yet haue they not opened anye waye vntoo them, in gyuing anye order, for them to knowe when the daye is an houre

longer

longer or shorter, wherby they myght at all tymes knowe the length of the day, which notwithstanding is very necessary for them, for that they be abroade vnder sayle bothe night and day, and in like maner for that they must keepe account of houres and tymes exactly, in as much as they ought to keepe an account of the shippes way: wherfore it must needes be must necessary for naugation, to knowe the true tyme of the Sunnes rising and setting, which you shall knowe by this meanes: first this is not vnknowne, that vnder the Equinoctiall the Sunne is.12.houres aboue the Horizon, & 12.houres vnder the the Horizon, (what declination soeuer the Sunne hath) so that there the Sunne ryseth at.6. of the cloke and setteth at.6.of the cloke for euer. And where the pole is rayled.16.degrees and.44.minutes, there the longest day is.13.houres, (the Sunne hauing hir greatest declination at.23.degrees.28.minutes) and the shortest day is 11.houres long: and then looke when the Sunne hath declined.23.degrees and a halfe eyther backwards or forwards, for then the day is an houre longer or shorter and proportionably: whē the Sunne hath declyned.11.degrees.44.minuts, then it is halfe an houre longer or shorter. &c. Moreouer where the pole is eleuated.30.degrees.48.minutes, there the longest day is.14.houres, and the shortest day is.10.houres long, the Sunne then rising at.5.of the clocke, and setting at.7.of the clocke, and there when the Sunne hath declined.11.degrees and.44.minutes from the Equinoctiall .&c. vntō the greatest declination, then the day is an houre longer or shorter, and when the Sunne hath declined.5.degrees.52.minutes then the day is half an houre longer or shorter. &c. Furthermore also, where the pole is raised.41.degrees.23.minutes, there the longest day is.15.houres, and the shortest.9.houres long, (the Sunne hauing hir greatest declination, and as thē rising at.4.of the clocke.20.minutes, and setting at.7.of the clocke.30.minutes) so that there when the Sunne hath declined.7.degrees.49.minutes from the Equinoctiall, the day shall

How necessary it is for a Seafaring man to know the length of the day.

Vnder the Equinoctial the day is alwayes. xii. houres long. The pole.16 degrees.44. min. the day 13.houres long, when it is at the longest.

The pole 30.degrees 48.minuts: the longest daye. 14. houres long.

The pole 41. degrees 23. minuts, the longest daye. 15. houres long.

.shall be an houre longer or shorter, and when it hath declined 3.degrees.54.minutes, the day shall be halfe an houre longer or shorter.&c. And furthermore, where the Pole is rayled.49 degrees one minute, there the longest day is.16.houres, and the shortest.8.houres long, the Sunne rysing at.4. of the clocke, and setting at.8. of the clocke, so that there when the Sunne hath declined.5.degrees.52.minutes from the Equinoctiall, then shall the daye be an houre longer or shorter. And when the Sunne hath declined.2.degrees.56.minutes, then the daye shall be halfe an houre longer or shorter.&c. Yet furthermore, where the Pole is rayled.54.degrees.30. minutes, there the longest day is.17.houres, and the shortest 7.houres long, the Sunne then rysing at.3.of the clocke.30. minutes, and setting at.8.and.30.minutes: where when the Sun hath declyned.4.degrees &.41.minutes from the Equinoctial, to the greatest declinatiõ, the day is an houre longer or shorter, and when she hath declined.2.degrees.21.minuts, the day is halfe an houre longer or shorter.&c. Where also the Pole is rayled.58.degrees.27.minutes, there the longest day is.18.houres long, and the shortest but.6.and there when the Sunne hath declyned.3.degrees.55.minuts from the equinoctiall, then the day shall be an houre longer or shorter: and whẽ the Sunne hath declined.2.degrees, lacking.2.minutes, then the day shall be halfe an houre longer or shorter. Furthermore also, wher the pole is raised.61.degrees.18.minuts, there the longest day is.19.houres long, and the shortest but.5 houres: then shall the Sunne ryse at.2.of the clocke.30.minutes, and set at.9.and.30.minutes, and there when the Sun hath declined.3.degrees and.21.minutes from the Equinoctiall, then shall the daye be an houre longer or shorter.&c. Furthermore, where the Pole is rayled.63.degres.22.minutes, there the longest daye is.20.houres long, and the shortest but.4.houres, then shall the Sunne ryse at twoo of the clocke, and set at tenne of the clocke, and when the Sunne hath declyned two degrees, and fiftie sixe minutes

The pole rayled.49. deg.1.mi. then the longest day is 16.houres long.

The pole raised.54. deg.30.mi. then the longest daye is 17.houres long.

The pole rayled.58. deg.27.mi. the longest day is.18. houres long.

The pole rayled.61. deg.18.mi. the longest day is.19. houres long

The pole 63.deg.1. mi. the longest day.20. houres long

The pole rayſed .64. degrees .49. minutes: the longeſt day 21. houres long.

The pole. 65 degrees: the longeſt day 22. houres long.

The pole. 66 degrees. 20. minutes: the longeſt day 23. houres long.

The pole. 66 degrees. 32. minuts, then the Sunne ſhall not ſet vnto them.

The Sunne cleane aboue the Horizon due North, & not to appeare aboue the Horizon South, at noone.

from the Equinoctiall vnto the greateſt declination, then ſhall the day be an houre longer or ſhorter. &c. Now where the pole is rayſed. 64. degrees. 49. minutes, there the longeſt day ſhall be. 21. houres long, and the ſhorteſt but. 3. houres: And ther when the Sun hath declined but. 2. degrees. 36. minutes from the Equinoctiall vnto the greateſt declination, the day ſhall be an houre longer or ſhorter. Where alſo the pole is rayſed. 65. degrees, there the longeſt day ſhall be. 22. houres, and the ſhorteſt but. 2. houres long, and when that the Sunne hath declined but. 2. degrees and. 20. minutes from the Equinoctiall. &c. then the daye ſhall be an houre longer or ſhorter. &c. And where the pole is rayſed. 66. degrees. 20. minutes, the longeſt day ſhall be. 23. houres long, and the ſhorteſt but one houre long, and then when that the Sunne hath declined but. 2. degrees. 8. minutes, then the day ſhall be an houre longer or ſhorter, and then where that the North pole is rayſed. 66 degrees and. 32. minutes, there it is 24. houres long, for that when the Sunne hath his greateſt declination vnto the Northwardes, then at mydnyght you ſhall ſee halfe the Sunne, and then when that the Sunne hath the greateſt declination vnto the South partes, then you ſhall ſee but halfe the Sunne at noone, and then in the going but 15. miles further vnto the Northwards, that is, but one quarter of a degree, then the Sunne ſhall be cleane aboue the Horizõ at the due North, and not ſeene vnto the South at noone aboue the Horizon, the Sunne hauing his greateſt declination to the South, and then the day ſhal be an houre longer or ſhorter, when that the Sunne hath declined one degree. 57 minutes from the Equinoctiall, and ſo forth vnto the greateſt declination. And thus much haue I ſayd as touching the length of the daye, whereby you maye knowe at all tymes the true length of the day in any Latitude betweene the Equinoctiall and the eleuation of the pole at. 66. degrees and 32. minutes, by knowyng howe manye degrees the Sunne is declined, and that you may know on euery day by the re-

giment

giment going before, hauing this consideration, that if the Sunne being vppon the Equinoctiall, and hauing no declination, that then in anye Latitude the daye is alwayes iust.12. houres long. And you must note this, that it is called the day, from the rysing of the Sunne, vnto the setting of the same vnder the Horizon, and not from day lyght vnto day light. For before the Sun ryse, and after that the Sun is set, it is counted for no parcell of the day, but it is called the day lyght. And furthermore, the day light will appeare by that time that the Sun doth touche the .17. degree of the Horizon before the Sunne rysing, and also the daye lyght will not be cleane gone vntill the Sunne bee more than .17. degrees vnder the Horizon: for as you may perceyue here with vs at London, that when the Sunne hath his greatest declination vnto the Northwardes in June, that the day lyght remaineth all nyght, for that the Sunne goeth not vnder the Horizon, but.15.degrees and.2.minutes.

To knowe the length of the day at any tyme in any place.

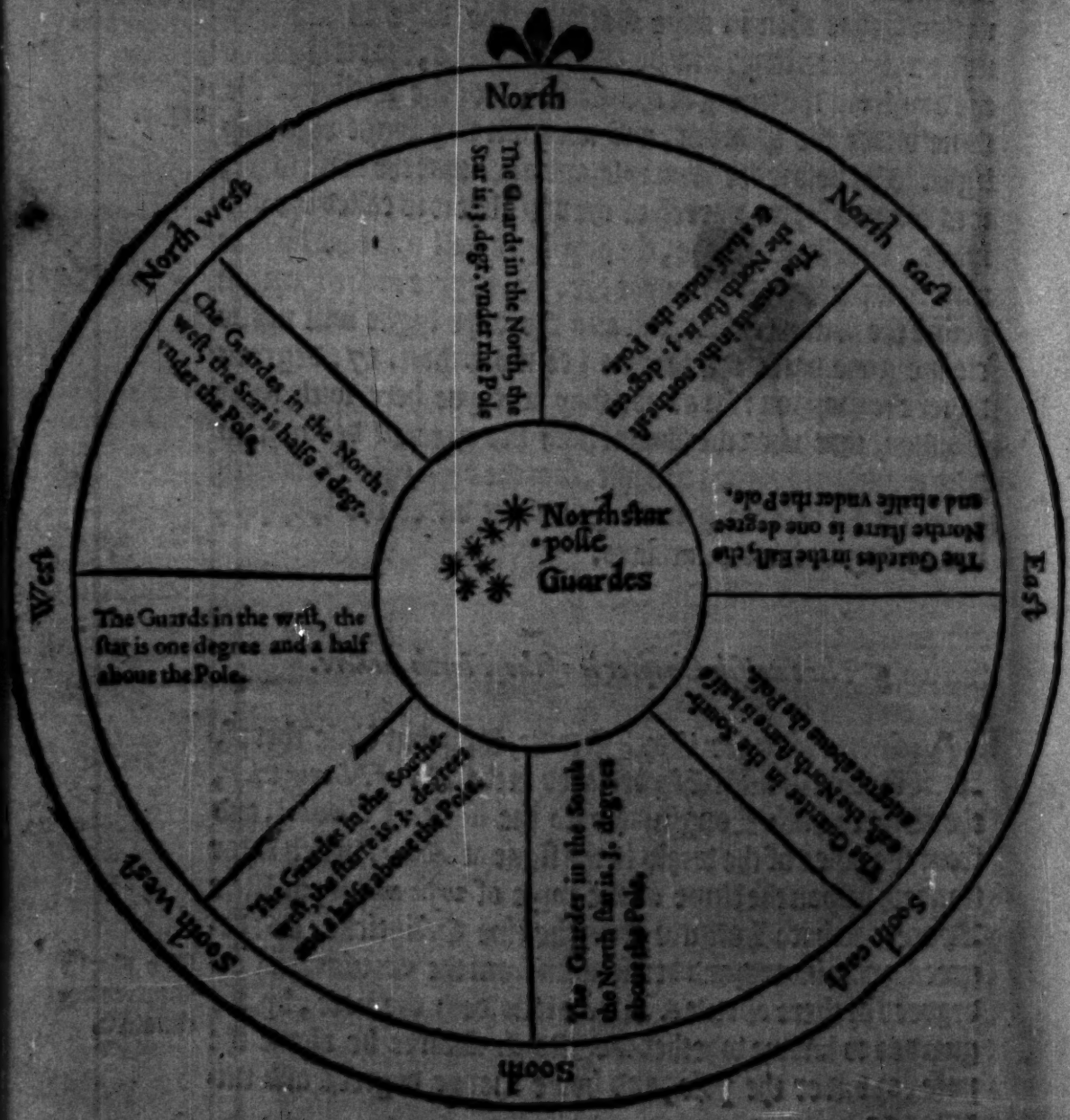
What the day is.

¶ The twelfth Chapter is of the North Starre.

AS touching the North Starre, I say but little therof, for that is sufficiētly declared in the *Art of Nauigation*, the Starre hath Longitude vnto the signe of *Gemini*, and from the poles of the world in the signe of *Aries*, which Star standeth vppon the tippe of the tayle of *vrsa minor*, or little Beare, and hath Latitude from the line Ecliptick. 66. degrees.30.minutes, and declination from the Equinoctial.96 degrees or there aboutes. Heere followeth the note, by the guardes to knowe whether the North Starre be aboue the pole, or vnder the pole, and howe manye degrees and minutes.&c.

The North Starres declination.

The Regiment for the sea.



¶ *The thirteenth Chapter doth shew you by the sailing vpon the quarter of your compasse, in how farre sayling you doo rayse a degree, and what you do depart from the Meridian, and in the end there is a demonstration therof.*

FUrthermore, bycause there be some that desire to knowe the alteration of a poynt: to this end, that in running of one poynte, they may rayse or lay a degree sooner in one than in an other: as in the sayling South or North, keeping one Meridian they rayse or lay the Pole. As this for example: In going to the North, you doe rayse the Pole, and lay the Equinoctiall: contrarywyse, going towardes the South, you lay the Pole, and rayse the Equinoctiall. But in sayling or going East or West, you doe neyther alter your Pole nor paralel, but onely your Meridian. Whereas in sayling of any other poynte, you do alter both your Pole and Paralele, and also your Meridian. Wherefore I will open vnto you (in sailing vpon one of the quarters of the compasse) what euery poynt doth rayse or lay one degree, in how farre sayling, and how many myles you be departed from the place you departed from, & what space you be departed from your Meridian. But heere is one thing to be noted (as I suppose) in the most part of cardes they allow for euery degree, but .17. leagues and a halfe: your cardes be most commonly made in *Lisborne*, in *Portugal*, in *Spayne*, or else in *Fraunce*. But as I take it, we in England should allowe .60. myles to one degree: that is, after three myles to one of our Englishe leagues, wherefore twenty of our Englishe leagues should answeare to one degree, for that three of our myles wyll not make one of their leagues. And bicause they make their accountes by their leagues in the Cardes, and not by ours, therefore I wyll shewe you by our Englishe myles. An Englishe myle conteyneth a thousande paces, and euery pace fiue foote,

In going southwards you rayse the equinoctial, and lay the pole: in goto the North wards rayse the pole and lay the Equinoctiall.

Of englishe leagues and spanish leagues.

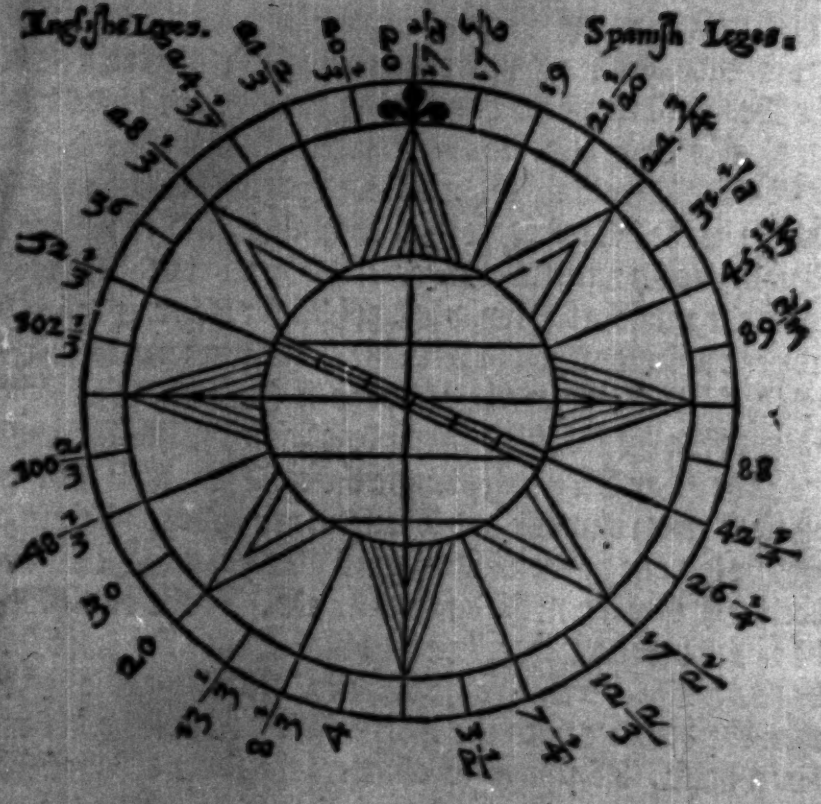
and euery foote twelue ynches. Nowe some thinke that a pase cannot be fyue foote, but a pase Geometricall is twoo reasonable steppes, for it can not be a pase, vntyll the hynder foote be remoued forwardes, and those two steppes wyll containe fiue foote, and so may any man indure to go at pleasure. But nowe to our purpose. For the sailyng of one quarter of the compasse, this is to be noted: First that in sailyng directly South or North, you doo raise or lay the Pole a degree in three score myles going. In the altering of one poynt from the South or North in three score and one myles: and you be departed from the lyne of the East and West, or the Meridian twelue myles. In altering of the seconde poynt, you raise a degree in sailyng three score and fiue myles: and depart from your Meridian fiue and twenty myles. In altering of the third poynt, you doo raise or lay one degree in sailing three score and twelue myles and a. 9. part: and are departed from your Meridian fourtie myles. Moreouer, in altering of the fourth poynt, you doo raise or lay a degree in the going of foure score and fiue myles: and departe from your Meridian three score myles. In altering of the fift poynt or wynd, you raise a degree in the sailing of. 108. myles: and depart from your Meridian foure score and ten myles. In sailing by the first poynt, you raise or lay one degree in. 157. myles: and depart from your Meridian line. 145. myles. Last of all, in sailing by the seuenth poynt or winde, you doo raise a degree in going of. 308. miles, and depart from your meridian line. 302. miles: and after this maner you may consider of the other three quarters of the Cõpasse. But if you require to know the raising or laying of a degree by the leagues of the Cardes: that is, at 17. leagues and a halfe: then reade the *Art of Nauigation*, and there shall you find how many degrees you be departed from your Meridian, and also from the place that you departed from: and yet that serueth for none other place but onely for vnder the Equinoctiall, for he that maketh accoũt of it in any other place, shal be deceiued. For euer as you

A degree is 60. miles or 20. English leagues.

A note to know in how far sayling you do rayse or lay a degree in the sayling by any one poynt of the compasse.

goe

goe to any of the two poles, your degrees be styll shorter and shorter, tyll such tyme as your Meridian meete vnder the two poles, wherof I intreate in the sixteene Chapter. For the better vnderstanding of the things aforesaid, looke on this figure folowing.



¶ The. 14. Chapter teacheth to knowe how farre any lande is off from you, knowing but the distance betweene any two places: whether you runne along by the lande, or directly to the shoare, or otherwise: with other necessary things.

FOr that I knowe it very necessary and profitable for Seamen, to knowe howe neare or farre they be into the Sea, and how neare to the land, I wyll intreate thereof for diuers

considerations: And first, bycause in running alongst the land there may be daunger, which may be such a certaine quantitie into the sea, that they may go both within them and without them. And also in lyke manner, for that being at one distance from the land, the land may ryse in such a shape or fashion, whereas being nearer, the lande maye ryse in another forme or fashion, for being far off, you shall see the hils within the lande, and being neare, the hilles or cliffes neare vnto the Sea coast maye take awaye the sight of the lande within. Furthermore also, it is verie necessarie to knowe in what fashion the lande doth ryse vpō diuers poynts of the compasse, as ofte as the fashion of the land doth alter, and to note it in some booke for remembrance. First by what poyntes of the compasse, then the fashion, & last, at how far off. &c. For knowledge how farre off you be from the lande, you may haue this helpe, if there be any. 2. places by the Sea coast, wherof you knowe the distance, how many leagues or miles the one is from the other. In going alongst the coast you shall set them by with your compasse, and when you are thwart of them, if they be but one poynt asunder, you shalbe. 5. tymes the distance betweene them from the lande or shoare. If the two places be two poyntes asunder, then the distance vnto the shore shall be two tymes and a halfe the distance. If. 3. poynts asunder, then the distance vnto the shoare shall be once the distance and a halfe. If. 4. poyntes asunder, the same distance shall be betweene you and the shoare, that is betweene the two markes. If. 5. poyntes asunder, then is it vnto the shore but. 2. third partes of the distance between the. 2. places. If. 6. points asunder, (you being thwart of one of them) then shall the distance vnto the shore be, not halfe the distance betweene the. 2. places. And in all these cases before rehearsed, the one place must be thwart of you, the other must be a head or sterne of you: and so it is exacte and true. As for ensample this: I (going alongst by any coaste) do knowe before hand how the one place doth beare from the other, besides this also I know

A note for the land rysing in diuers shapes or fashions

To knowe how far the lande is from you.

Where two lands be but one poynt asunder.

the distance, that is to say, howe many leagues they be asun-
der. As for ensample, the.2. places assigned beare East and
West the one from the other, I then (knowing that they be
3. leagues asunder) when I haue brought one of the places
South or North of me, do set them with my compasse, the one
being North of me, and the other bearing North and by east
that is one poynt asunder: Nowe the distance vnto the shore,
being.5. times the distance between the.2. places which be.3.
leagues asunder, I knowe the shoare to be. 15. leagues from
me, which (if the places were but one league asunder) should
be but.5. leagues from the shoare. Furthermore if the places
be.2. poyntes asunder, that is to say, the one North, and the o-
ther North Northeast, then shal the distance vnto the shore be
7. leagues and a halfe from me. Whereas if the.2. places were
but a league asunder, it shuld be but.2. leagues & a half vnto the
shore. And furthermore, if the places be.3. points asunder, that
is to say, the one North, and the other Northeast & by North,
the distance vnto the shore shall be. 4. leagues & a half: wher-
as if the.2. places were but one league asunder vnto the shore, it
should be but a league & a half. If.4. poynts asunder, that is to
say, if the one place be due North, and the other place North-
east, then it is vnto the shore.3. leagues iust. If but one league
asunder, then but one league vnto the shore. Moreouer if the
2. places be.5. poynts asunder, that is to say, the one north, and
the other Northeast & by east, then the distance vnto the shore
shall be but.2. leagues: whereas if the.2. places were but one
league asunder, vnto the shore shold be but.2. miles. Last of al,
if the.2. places be. 6. poynts asunder, that is to say, the one
north, and the other east northeast, then it shall not be a league
and a halfe vnto the shore. &c. But if you come directly to the
landwardes, hauing no cause to be thwart of none of those
knowne places, then to knowe how far you be from the lande,
you must do as is by the places before spoke of. For if you go
in due north the one place being north & by west, & the other
north and by east, then (the.2. places being. 3. leagues asun-

Of 2. places to be one point asunder.

To be two points asunder.

3. pointes asunder.

4. pointes asunder.

5. pointes asunder.

6. pointes asunder.

Of going vnder sayling right into the shore

der) you shall be.7. leagues and a halfe from the shore: so that if you runne into the shore due north, vntill they be.4. poyntes asunder, that is to say the one north northwest, and the other north northeast, then it shall be vnto the shore. 3. leagues and 3. quarters. And furthermore, you still running in due North till the.2. places be.6. poynts asunder, that is to say, the one place to be northweast and by north, and the other place to be northest & by north, the distance vnto the shore shall be. 2. leagues and a quarter. And againe, if you runne in due north, vntill they be.8. poyntes asunder, that is to say, the one place northweast, and the other northeast: then the distance vnto the land or shore, shal be but half the distance betweene the. 2. places, that is, but one league and a half. Lastly, if you run to the lande due north, vntil the.2. places be.10. poims asunder, that is to say, the one place northweast and by weast, and the other northeast and by east, then the distance vnto the shoare, shall be but one third part of the distance betweene the.2. places, that is, but one league from the land. &c. Thus much haue I sayd as touching the bearing of the lande from you, by the points of the compasse, to know the distance, or how far the land is of: which is very necessary for Seamen to knowe, for diuers considerations, as I sayd before. If now therfore you knowe not howe one headland doth beare from another, doe thus: in running alongst the coast, when you see the appearing of any land one before another, set them with your compasses, and looke how they beare from you, by what poynt of the compasse, and so shall you know iustly, howe the one lande doth beare or lye from the other. And by this order you may correct your plats, by doing this, as often as you see. 2. notable places together: as Ilands, rocks, headlands, mouthes of hauens, sandes, or whatsoeuer else be worthy of noting, this dane, as often as you do see them together, set them with your compasse, & that wil shew you most certainly, that so they doo beare the one from the other. You may know the distance in like maner betweene them, if you knowe your ships way, as

A waye to knowe howe one headland beareth of another.

thus

thus, whē you first see any. 2. places togither, as. 2. headlands, or. 2. Ilands, hauing set them with your compasse, and knowing howe the one beareth from the other, then, for that you wil not come neare vnto them, you doo hale off from the land vntill that you haue brought your selfe farre ynough off, at youre discretion, and when you be thwart of the firste headlande, set the other land, and consider how it beareth from you: then recken your ships way, how many leagues the shippe myght goe, vntill you come thwart of the other headlande, keeping your course along as the. 2. headlands beare, and so shall you both knowe the distance betweene the. 2. places, and also howe farre you be off from them. In like maner, hauing consideration of the distance betweene the other places that you haue obserued, both by your compasse, and also the shippes way, you may know how farre it is to the shore, going right to the landwardes, by your crosse staffe, although you knowre not the distance between any two places. As thus: take the wideneſſe between any two places with your crosse staffe, bearing right to the landwardes, and then remoue the crosse staffe, or transitorie, halfe the length of the transitorie, that is to saye, the end next vnto you, and then by running in till the. 2. endes of the transitorie doo agree with the two markes, you shall be halfe way to the shore: then looke howe farre the shippe hath gone in that tyme, for the same distance is vnto the lande frō the ship. But if you remoue the transitory but a quarter the length of the transitory to youwards, then at the place where the end of the transitorie doth agree with the. 2. markes, shall be one quarter of the distance betweene the shore & you at the first obseruation: & it shall be. 3. tymes that quantitie vnto the shore. &c. And to know the ships way, some doo vse this, which (as I take it) is very good: they haue a pece of wood, & a line to vere out ouer boorde, with a small line of a great lengthe, which they make fast at one ende, and at the other ende, and middle, they haue a piece of a lyne, which they make fast with a small thred to stande lyke vnto a crowfoote: for this pur-

To know the distaunce at Sea betwen any two hedy landes.

To knowe how far it is vnto the land another way.

To knowe the shyps way.

pose, that it should driue asterne as fast as the shippe doth go away from it, alwayes hauing the line so ready, that it goeth out as fast as the shippe goeth. In like manner they haue either a minute or an houre glasse, or else a knowne parte of an houre, by some number of woordes, or suche other lyke, so that the line being vered out, and stopt iuste with that tyme that the glasse is out, or the number of woordes spoken, which done, they hale in the logge or piece of wood again, and looke howe many fadome the shippe hath gone in that time: that being knowne, what parte of a league soeuer it be, they multiplie the number of fadomes, by the portion of time or parte of an houre. Whereby you maye knowe iustly howe many leagues and parts of a league the ship goeth in an houre. &c. For an Englishe league doth containe. 2500. fadome. And a spanish or portugale league doth contayne. 2857. fadomes. &c.

An englyshe league. 2500. fadome.

A Spanishe league. 2857. fadome.

¶ The fifteenth Chapter or rule treateth of the Longitude. &c.

NOwe some there be that very inquisitiue to haue a way to get the longitude, but that is to tedious. For this they must consider, that the whole frame of the firmament is caried round from the east to the west in. 24. houres, so as ther remaineth neither lyght nor marke, but goeth round, sauing only the. 2. poles of the world, and these. 2. stand alwayes fast. But (as I sayd before in the. 9. rule) of him that going South or North doth rayse or lay the pole, and in lyke case of the Equinoctiall altering his Paralel, and causing the light of the firmament to alter the tyme of their shining or abyding aboue our Horizon: so he that goeth directly east or weast, doth neither rayse nor lay the pole, so that stil the lyghts of the firmament doth make one maner of arch according to their latitude or declinatiō: but the going east or west doth alter the meridian, causing the planets to haue their aspects at another houre or tyme, altering the tyme of the changes of the moone, & also

Altering the time of rising and setting of the lights.

the

the tyme of the Eclipses: which is necessary for all trauellers by Sea or by lande. Therefore I thought it needefull to be spoken of: for as countries haue Latitude from the pole, so in like manner they haue appoynted Longitude. Now therfore you maye get the Latitude with instrumentes, but the Longitude you muste bring from another place, which you can doo but with a globe or else a mappe or carde, and then you muste measure from the Meridian of the Canarie Ilandes, otherwise called the fortunate Ilandes. And in oure Latitude of London euery .555. myles which conteyneth .15. degrees, will answere to one houre of tyme: and vnder the Equinoctial .900. miles to .15. degrees: the degrees be as long as the degrees of Latitude, but towardes the pole fewer and fewer, till they come to nothing vnder the .2. poles. And nowe .37. miles with vs at London, will answere to one degree of our Latitud at .51. or .52. degrees of elleuation of the Pole, but the cause whye the Longitude was fetched from the Canarie Ilands, I knowe not, but it was as I suppose, bycause it was then the westermost place then knowen: for *Ptholomeus* was the first that ordeyned that rule.

Altering the aspects.

Of Latitude and Longitude.

15. degrees is an houre of time and at London it is .555. miles.

Longitude beginneth at the Cannary Ilandes.

Nowe furthermore bycause you shall knowe the better, I would draw out certaine of the cheefest places about this Realme of England, both their Longitude and Latitude, by which you shall knowe what manner of Arch the Sunne with the other lights doth make, and also by the Longitude you may knowe at what time the Moone with any of the Planets doth make any aspect. Besides this, the Eclipses of the Sun or Moone, with the chaunge, quarters, and full Moone, by a true and exact Ephemerides, throughout all England to knowe the very true houre and minute of the time of the Diameter: considering for what Longitude or place youre Almanacke was made. And now to get the Longitude, you may doo it at the time of the Eclipse of the Moone, for that the Eclipses of the Moone be generall, so that she being aboue your Horizon in any place vpon the superficiall parts of the earth,

To know the true time of the aspects of the mone.

or Sea, considering (as I sayd before) by your Almanacke, at that time when the Eclipse should happen, the very houre and minute, knowing also the place that your Almanacke was made for: that doone, according to this rule, with a precise instrument you shall take the alteration of the tyme with the houre and minute of the Eclipse. And furthermore you might knowe your Longitude with the Ephemerides, by the coniunction of the Moone with other fixed starres, if it were not for one greate infirmitie, and that is the Paralex of the Moone, which the Semidiameter of the earth dooth cause, by nearenelle of the Moone vnto the earth: wherefore I woulde not any Seamen should be of that opinion that they myght get any Longitude with instrumentes. Therfore let no Seamen trouble themselues with any such rule, but (according to their accustomed manner) let them keepe a perfit accompt and reckening of the way of their shippe, whether the shippe goeth to leewardes, or maketh hir way good, considering alwayes what things be against them or with them: as tides, currents, winds, or such like. As for the rule of Longitude, it followeth in the next Chapter.

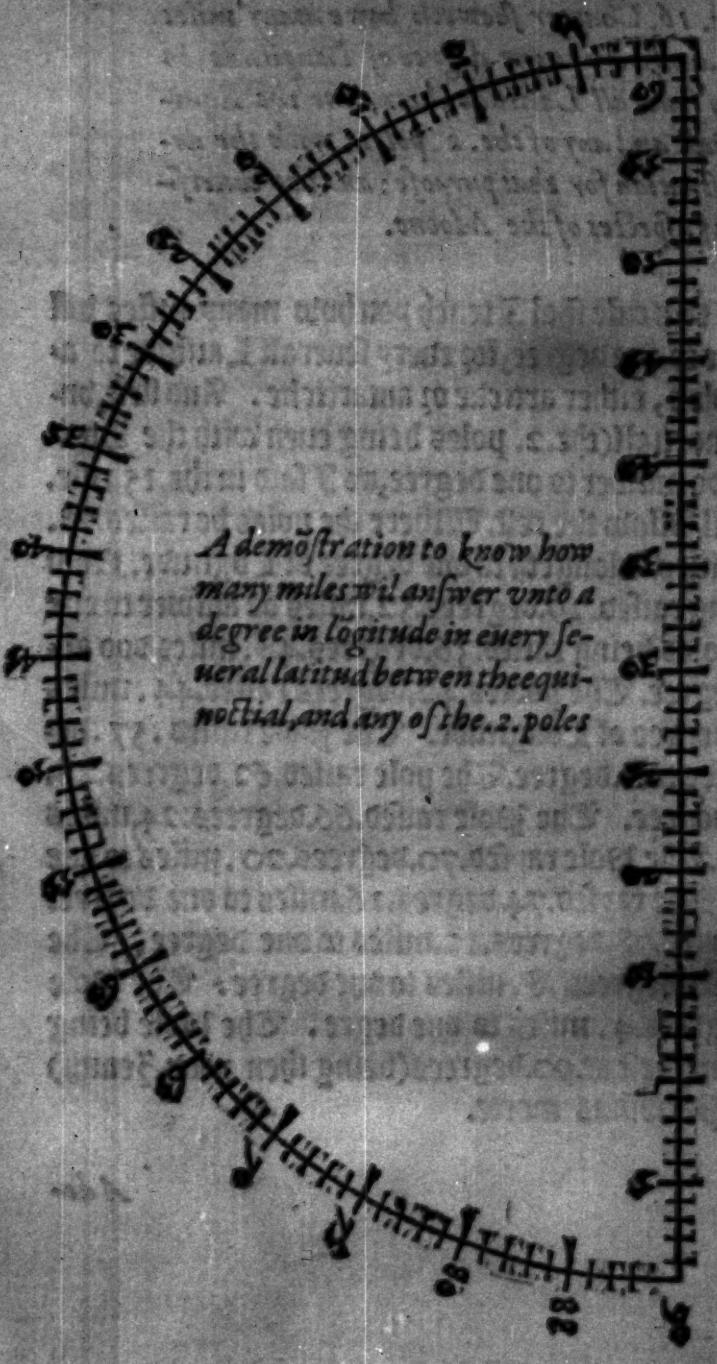
The longitude is not to be gotten with instrumentes on the sea.

The

¶ *The. 16. Chapter sheweth howe many miles will answere to one degree of Longitude, in euery seuerall Latitude, betweene the Equinoctiall and any of the. 2. poles: with the demonstration for that purpose: and the diuersities of aspectes of the Moone.*

NOw by this rule shal I teach you how many miles will answere to one degree, for euery seuerall Latitude to any of the. 2. poles, either artick or antartick. And first, vnder the Equinoctiall (the. 2. poles being euen with the Horizon) 60. miles do answer to one degree, as I said in the. 15. rule. And now shall follow the rest. Where the poles be raised. 21. degrees. 56. miles belongeth to one degree of Lõgitude. Now the poles being raised. 29. degrees. 52. miles do answer to one degre. The poles being raised. 36. degrees. 48. miles doo answer to one degree. The pooles. 42. degrees raised. 44. miles goeth to one degree of Longitude. The Pole raised. 57. degrees. 32. miles to. 1. degree. The pole raised. 62. degrees. 28. miles to one degree. The Pole raised. 66. degrees. 24. miles to one degree. The Pole rayled. 70. degrees. 20. miles to one degree. The Pole rayled. 74. degres. 16. miles to one degree. The Pole rayled. 78. degrees. 12. miles to one degree. The Pole rayled. 82. degrees. 8. miles to one degree. The Pole rayled. 86. degrees. 4. miles to one degre. The Pole being rayled to the hygheſt at. 90. degrees (being then your Zenith) there all the Meridians meete.

A de-



A demõstration to know how many miles wil answer vnto a degree in lõgitude in euery seuerall latitud betwen the equinoctial, and any of the .2. poles

This demõstration doth shewe you, howe manye myles wyll answer to a degree, for euery seuerall altitud of the Pole: in the half circle is marked the eleuation of the Pole: in the line of diameter, or right line, is marked the miles answeryng euerye degre: and to knowe howe many miles will answer vnto one degree first lay the fyxed vnto the eleuation of the pole that you doo requyre the nũber of myles vnto, one degree: & then the iust

length

length of the threde being marked, laye the threde vntoo the line of Diameter, or ryght line, which is the line of miles, and then you shall see at that place is the number of miles vnto one degree.&c. Now you must consider that euery houre of time in the chaunging of the Moone or of the Eclipses you must allow.15. degrees, euery degree in miles as you do see in your Latitud of the coūtrie, as thus: those places that be to the Westwardes of your towne, place or countrie by.15. degrees the Moone shall chaunge rather with them than with you by one houre, bycause that they shall touch your Meridian before theirs by one houre. And if the towne or place be to the Eastwards of you by.15.degrees, then shall the Moone chaunge rather with you than with them by one houre, as for an ensample thus, with vs at London, the.11.day of May 1574.the Moone shal chaūge at.12.of the clocke at Noone.5. minutes. Now to the Westwards as farre as Lishburne in Portingall the Moone shall chaunge that same daye at.11.of the clocke.8.minutes, the Longitude being thereof from the Canarie Ilands .5.degrees .36. minutes. Now to the Eastwards, that same day at noone, the Moone shall chaunge at one of the clocke.12 minutes, bycause that they haue Longitude.36.degrees.40.minutes from the Camary Ilands, and then by this accompt.7.degrees and a half will answer to halfe an houre, and then.3.degrees and a quarter will make a quarter of an houre, and then.9.miles and a quarter will make one minute of time with vs at London in our Latitude, so by this rule you may knowe at what tyme and minute the Eclipses or chaunges of the Moone doe happen, knowing for what place your Almanacke was made, for commonly we heere in England do make them for the cittie of London. Thus much haue I sayde as touching the true tyme of the chaunge of the Moone, for that some people (as I haue sayde before in the .3. chapter) do contemne and say, why do they not giue or make rules for euer, to knowe the houre and minute of the chaunge, full, and quarteres of the

15. degrees answereth vnto an houre of time.

To know the true tyme.

Moone: And yet they be vtterly voyde of any knowledge in the Mathematicall Science, whereby they myght knowe the true time of the chaunge of the Moone: For it is a question Astronomicall, to knowe the Moones motion: a question Geometricall, to knowe the true time of the aspectes, or measure betweene the Sunne and the Moone: and thirdly, it is a question Cosmographicall, to knowe the true Longitude of the place he is in, at the time when the Moone chaungeth, &c. Now foloweth the next rule which shall treate of Longitude and Latitude.

of the change and quarters of the moon is a question astronomical, geometricall, and cosmographicall.

The.17. Chapter or rule treateth of the Longitude and Latitude of certaine of the most notable places in England: and also howe long the Moone doth chaunge at the one towne before the other: vvith the diuersitie of the longest day in Sommer, from South Hamton to the Northermost parte in Scotland.

NOwe in this rule foloweth the Longitude and Latitude of the most part of the principal places in England. The Southermost place in England, is the Lizarde in Cornwall: the Longitude therof is. 15. degrees. 5. minutes: the Latitude 50. degrees. 45. minutes. S. Michaels Mount hath in Longitude. 14. degrees. 20. minuts: in Latitude. 51. degr. 6. minutes. Falmouth hath Longitude. 15. degrees. 12. minutes: Latitude. 51. degrees. 0. minutes. Plimouth hath Longitude 19. degrees. 7. minu: Longitude. 51. degrees. 1. minute. South Hãpton Longit. 18. degr. 52. minuts: Latitude. 51. degr. 2. mi. Portsmouth Longitude. 19. degrees. 7. minuts: Latitude. 51. degrees. 3. minutes. Rye Longitude. 20. degrees. 22. minutes: Latitude. 51. degrees. 5. minutes. Douer Longitude. 21. degr. 50. minuts: Latitude. 51. degrees. 264. minuts. Canterburie Lon-

Longitude.21.degrees.25.minuts: Latitude.51.degr.28.mi. Sandwhich Longit.21.degrees.38.mi. Latitude.51.degr. 29.minuts. London Longitude.15.degr.54. minutes. Latitude.51.degr.32. minuts. Graueſend Longit.20.degr.14. minuts. Latitude.51.degr.31.minutes. Briſtowe Longitude 17.degr.8.minuts. Latitude.51.degr.42.minuts. Haruarde Longitude.17.degr.0.minutes. Latitude.52.degr.2.minuts. S.Dauids head Longitude.15.degr.5.minuts. Latitude.52. degr.15.minuts. Oxford Longitude.18.degr.59. minuts. Latitude.51.degr.50. minuts. Cambridge Longitude.20.degr.6 minuts: Latitude.52.degr.0.minuts. Norwhich Longitude 21.degr.20.minuts. Latitude.52.degr.10.minuts. Lincolne Longitude.20.degr.28.minuts. Latitude.52.degr.6.minuts. Welshpoole Longitude.16. degr.40. minuts: Latitude.53. degr.6.minuts. Weſtchester longitude.15.degr.29.minuts: latitude.53.degr.34.minuts. Hull longitude.20.degrees.54. minuts: latitude.53.degrees.57.minuts. Yorke longitude.20. degr.0. minutes: latitude.54.degr.1.minute. Cockermouth longitude.17.degr.0. minutes: altitude.55. degr.8.minutes. Carlyle longitude.17.degrees.48.minuts: latitude.55.degr. 2.minutes. Newcaſtle longitude.20.degr.31.minutes: latitude.55.degr.0.minutes. Barwicke longitude.20.degr.48. minutes: latitude.56.degr.23.minutes. Edenborow in Scotlande, longitude.19.degr.50. minutes: latitude.57. degr.0. minuts. Now by the Longitude & Latitude you may knowe the length of the day both in Sommer and in Winter, with the perfit houre and minute of the chaunges of the Moone, & how long the Moone doth change at one town before another, through the whole realme of England. And now in order as I haue begon before, I will shew you the diſtance of tyme, And firſt at S. Michaels Mount, the Moone changeth rather than at London by.25.minutes. Rather at Falmouth than at London by.20.mi. At Plimmouth rather than at London by.18.minuts. At South Hampton rather than at London by 5.minuts. At Portſmouth rather than at Lon.by.4.minutes.

To know the diuerſitie of the tyme of the chaunge of the moone through all England.

At Rye later than at London by one minute and ½. At Douer later than at London by.6.minutes and moze. At Canterburie later than at London by.5.minutes. At Sandwhich later than at London by.6.minuts. Grauesend later than at London by one minute and a half. Bristow rather than at London by .11. minutes. Harnard rather than at London by 12.minutes. Saint Dauids head rather than at London by 19.minutes. Oxforde rather than at London by 4.minutes. Cambridge later than at London by. ⅓. partes of a minute. Norwhich latet thā at London by.5.minutes and moze. Lincolne later than at London by.2.minutes. Welshpoole rather than at London by.16. minutes. Westchester rather than at London by.10.minutes. Hull later than at London by 4.minutes. Yorke later than at London by. ¼. of a minute. Cockermouth rather than at London by.12.minutes. Carelyle rather than at London by.9.minutes. Newcastle later than at London by.2.minutes. Barwicke later than at London by thzee minutes and moze.

The cause why that it is called the chaunge of the Moone, is foz that the Moone chaungeth the sydes of the Sunne, foz before the change, the Moone is on the West side of the Sun: and after the chaunge, the Moone is on the Easte syde of the Sunne. &c. Nowe in lyke manner, I thinke it necessarie to be spoken of the difference of the longest day in Sommer, in euery seuerall Latitude, thzough the whole Realme of England frō the Southermost part, called the Lizard, to the Nozthermost part in Scotlande: and this is called the day, from the Sunne rysing oz appearing aboue the Horizon.

To know the length of the longest day through al Englande & Scotland.

Firste at South Hampton the longest daye is.16. houres long. 26. minutes, the shortest. 7. houres. 54. minutes. At London. 16. houres. 30. minutes longest. 7. houres. 30. minuts shortest. At Lincolne. 16. houres. 45. minuts longest. 7. houres 15. minutes shortest.

At Yorke, the longest. 17. houres, the shortest. 7. houres Newcastle the longest. 17. houres. 12. minutes, the shortest. 6. houres

houres.48.minutes.Barwicke,the longest.17.houres.30.minutes,the shortest.6.houres.30.minuts. Edenborow in Scotland, the longest day in Sommer.17.houres.45.minutes,the shortest day.6.houres.15.minutes. Now Catnes poynt being the northermost part in all Scotlande, the Pole being rayled to.62.degrees,there the longest day is.19,hours.30.minuts, the shortest daye.4.houres.30.minutes. Nowe this you doe consider,loke what the longest day doth containe,looke what that lacketh of.24.houres, that is the shortest Winter day,&c.

¶ The eighteenth Chapter or Rule sheweth howe to sayle by the Globe.

NOw to sayle by the Globe, it is conuenient to be spoken of. For that generally the most parte of the seamen make their account as though the earth were a platforme. For they do not consider that the earth is a Globe,and that the Meridians do growe narrower and narrower towards the.2.Poles, for it is vnpossible to drawe the face of the earth and the Sea true vpon a platforme, for if you will discribe the lande true, then shall not the Sea be true, for as you go towardes the North partes, your Meridians growe togither, so as your lines or poyntes be according to the arte of Hydrography for the Sea shall be broader to the North partes than it is. Now and if you woulde describe the Sea true, with lines, courses,distances, hauens,and daungers,then shoulde your lande be broader to the North partes than it is. As for ensãple, thus: Englande and Scolande being both one Ilande, in all your Cardes of Nauigation,the North parte of Scotland is drawn much bigger than it is, for otherwyse the lines of South & North shoulde not be according to the treating of the lande, for if you viewe it well, you shal finde the North

You cannot drawe the lande and sea true vpon a flat thing.

To make a Sea Plat or Carde.

ende of Scotlande much more in distance than it is. As you may see in measuring it by the trunke of your carde there. For youre better understanding, I will shewe you the compasse of the earth vnder sundrye Paralels or Circles, howe many myles the earth doth contayne in compasse. First, vnder the Equinoctiall (where the earth is at the greatest compasse) in going directly Easte or Weste, that is, by a ryght line ouer Sea and Lande, the two Poles being euen wyth your Horizon: you haue. 21600. myles to come to the place you departed from. Under the Tropicke of Cancer, the North Pole being rayſed. 23. degrees. 28. minutes, going directly East & West: it is. 19800. miles in compasse in our artick circle of Lond̄, wher the pole artick is raised. 15. deg. 32. minuts, going East & west: it is. 13320. myles in cōpasse, then vnderneath the Polare circle where the Pole is rayſed sixtie sixe degrees, thirtie two minutes: it is. 8460. miles in compasse. By this you see that the compasse of the East and Weast lyne (comming from the Equinoctiall) is muche lesser to the Northwardes, than it is to the Southwardes. Wherfore when you shall haue any occasion to attempte any voyage to the North parts, it is best to sayle by a Globe: for so shall you better see the distances and bignesse of the landes, and in like manner your lines and courses. In this order, first (according to the accustomed manner) keepe a perfitte accounte and reckening of the waye of the shippe, by what lyne or poynte your Shippe hath made hir waye good, then muste you resorte to your Globe. After that consider whate place and Paralell you be in, whiche you maye doe by the Sunne by daye, and by the Starres by nyght. Nowe (knowing what place and Paralel you be in) sette your Globe to the eleuation of your Pole: that doone, turne to the place of your Zenith, and seeke the opposite of it in your Paralell: for then you knowe that in the same Paralell is youre Easte and Weste lyne: that had, the firste quarter of that circle to the Pole, muste be deuided into the eight points of your compasse, doing so likewise on

The compasse of the earth.

The compasse of the earth vnder the tropicke of Cancer

The artick circle of London vnder the Polare circle.

Howe to vse the Globe to direct your course, and to knowe howe that any place doth beare.

the

the other side. In like case if you come to the Southwards, deuide your.8.wyndes from your Antarticke Pole, to your Paralell circle: and thus must you doe euer and anon, for the oftner you do obserue this custome, the better & perfiter shal your course be. Now thus breefly I make an end of the sailing by the Globe, But for them that do occupie the Southparts, nothing is better than their cardes. Bycause I haue declared vnto you the length of certaine of the Paralels, what myles the Earth doth contayne in compasse vnder them, now will I shew you how many myles distance is betweene euery one of thē. And first, from the Equinoctial to the Tropicke of Cancer, (which is there where the Sun maketh his furthest progresse to the North partes) it is.1408.myles. Secondly, betwen the tropick of Cancer & our Artick circle of Londō it is 1684.miles. Thirdly, between our Artik circle & the Polare circle is.900.miles. Lastly, betweene the Polare circle and the Pole is.1408.myles. So that it is in all from the Equinoctiall to eyther of the two Poles.5400.myles: which is the fourth parte of the compasse of the whole Earth. Furthermore, for that you may the better vnderstande that the Earth is a Globe or Circular (which any person that doth occupie the Sea, seeth most apparantly) you shall perceiue it thus, if you see a Shyppe any thing farre off, you may perfitly see the sailes of it, but not the whole, the cause wherof is the circularnesse of the earth, and the water of the Sea: for that the water doth rise and swel between you and the other ship, according to the distance between both the ships: bycause the distance to the center of the earth or water, is in euery place alike. And he that hath desire to know further heerof, M. Dee hath made mētion therof in Euclides Elements in his mathematical preface, & also in the.12.booke, whither you may haue recourse, yet notwithstāding I wil say a little therof, wherby you may discerne how far it is possible to see a ship vpon the sea: as thus: if you be on the sea in a ship, so that there be but halfe a league between you & the other ship, the water wyll be

The dikaāde betwen the equicoctiall and the tropick of Cancer.

Betweene the artick cicle of London and the tropick of Cancer.

The cause why thht you may see the sailes of a ship & not the whole.

fyne

fyue ynches and a halfe hygher in the middle of the waye betweene both the ships, for that the water is equall in euery place vnto the center of the earthe, and then the water going by a croked lyne, then to strike it by a right line, the middle of the lyne that shoulde come from the center of the earth, shall be shorter than the other. 2. lines comming from the center of the earth betweene the. 2. shippes by. 5. ynches and a halfe, and then it must needes be sayde, that the water is hygher by the sayde. 5. ynches and a halfe. And furthermore, if the two shippes were a league asunder, then the water by his circularnesse should be. 22. ynches higher thā the leuell in the middle betweene both the ships. Furthermore, if the. 2. ships be 2. leagues asunder, then the water shall be hygher than the leuell in the middle betweene both the shippes by. 88. ynches, which is. 7. foote and. 4. ynches. If the. 2. shippes be. 3. leagues the one from the other, then the water shall be higher than the leuell in the mydway betweene both the shippes, by. 198. ynches, which is. 16. foote and a halfe. Furthermore, if the. 2. shippes be. 4. leagues asunder, the water shall be hygher than the leuell in the midway betweene both the shippes, by. 352. ynches, which is. 29. foote, and. 4. ynches. And furthermore, if the. 2. shippes were. 5. leagues asunder, the water shoulde be higher thā the leuell of the midway betweene both the ships by. 550. ynches, which is. 46. foote lacking. 2. ynches. Yet furthermore if the. 2. shippes were. 6. leagues asunder, the water should be higher than the leuell in the middle way betweene them by. 792. ynches, which is. 66. foote. Furthermore also, if the. 2. shippes were. 7. leagues asunder, the water should be higher than the leuell in the midway between both the ships by. 1878. ynches, and that is. 90. foote, which is as farre & rather farther than it is possible to see any ship vpon the Sea: Neyther is it possible to see any lande further, but such lande as is very high lande, which for the greatnesse of the heigth you may see it, wherfore. 6. leagues or. 9. leag. is called a ken. Now the circularnelle of the earth is the cause that you may

To knowe howe many foote and ynches that the water is higher than the Leuell of the Sea, betweene two shyppes.

What a ken is, and the cause why you may see a shyp further out of the top, than vpō the hatches.

see

see a ship or land further out of the top, than vpon the hatches: Wherefore it is a plaine case, that the Earth and Sea is not flat, but circular, as is afore declared. &c.

¶ *The. 19. Chapter, is as touching the making of Plats or Cardes for the Sea, and not to paint their cardes as they doo, but rather to supply the vacant places with other necessarie matters: and also of three necessarie things contained in the Plats or Cardes, and their vses, which is the most necessarie thing in Navigation.*

For the making of plats or cards, as touching *Hydrographia* cōmonly called sea cards, I meane to say litle therof: for that it is sufficienely declared in the booke called the art of Navigation: Saving this, I would wish them that be makers of plats and cardes for the Sea, not to paint their compasses with so many colours: neither vppon the Lande with so many flagges, for that it doth rather hurte than good: although it may be sayd, they be so paynted in bacant places, thos bacant places I would wish them to furnish with these 2 matters in this order. First, in some bacant place with a compasse there, to place agaynst euery poynt of the halfe of the compasse, letters, or some other figures or Carecters, then in lyke maner, (according to that place where such a Moone maketh full Sea) to make that letter or Carecter at the hauen, port, or place: As for ensample thus: I place *A* at the East point, *B* at the East and by South, *C* at the East southeast, *D* at Southeast and by East, and so consequently to all the pointes vnto the Weast, then that being doone, where it flowth an East Moone, I place *A* in the plat or carde, and where an East and by South Moone, I doo place *B* in the carde, and so forth, according to the place of the Moone that maketh a full Sea. And where it runneth halfe tyde vnder

Not to paynt their Sea cardes but to vse the bacant places with other necessary matters.

To draw the shape of the land in their Cardes.

other, to make some note vpon the poynt of the compasse, &c. This also is very necessary to be done, to furnishe vp all the vacant places of the plat or carde, to drawe the shape or fashion of euery head land or high land alongst euery coast that is needefull to be knowne, and at what poynte of the compasse the lande is of that fashion: at how farre off the lande ryseth in that fashion: and so to make the fashion of the lande as often as the lande altereth the forme and fashion: and last of all, at what poynte of the compasse the lande hath that shape or fashion: for being vppon one side, the land riseth of one fashion, and on the other side, of an nother forme or fashion. Also being neare the land, it will be in one fashion, and being far off in another fashion (as is before declared in the 14. Chapter) for there is nothing more needfull and necessary for a Seaman, than thys: to knowe the lande when he seeth it, and there is no way better, to make him remember it, than to haue notes howe the lande doth ryse vppon euery side, and what greater inconuenience maye there growe by any meanes, than there may by mistaking of a place: for it were twenty times better, to be throughly perswaded that he knoweth it not, than to thinke he doth knowe it not being that place. For wheras he doth thinke to preuent the dangers, he may willingly runne vppon the dangers, not known of him. Therfore in my opinion, they can doo no better than to furnishe their vacant places in their plats and cardes with this matter: for there can be nothing better. The vse of the Sea cardes is most necessary for Nauigation for long voyages: fyrst, for that it sheweth you howe one place beareth from another: secondly, the distance of any places howe farre the one is from the other. Of which the one is represented by the lines of the compasse: the other by the scale or trunke of measure, if the platte be truely made. Thirdly, it sheweth you in what Latitude from the Equinoctiall or Altitude of the pole any place is in, by the line of degrees. Now to direct your course through the Sea by the carde, to any

Great inconueniences by mistaking any place.

Howe necessary a thing the Sea cardes be.

Three necessary thinges in the Sea Cardes.

place

place assigned, you must first looke by what poynt of the compasse it beareth from you, from the place you meane to sette off from the lande, vnto the place you would first fall with. Which you shall know thus: seeke a lyne from the next compasse vnto the place you meane to depart from, then open your compasses vnto one of those lines by your iudgement that falleth neare vnto your place assigned: and let the other foote of youre compasses stand iust at that place where your shippe is, when you direct your course: that doone, beare your hands forwardes euen, and let the one end be still vpon the line to the which you did open your compasses, vntill you come to your place assigned. But if it falleth short of the place assigned, then take the nexte lyne nearer vnto the place you departed from: when you haue so doone, if your compasses doe ouerreache the place assigned, then take a lyne further off from the place you doo meane to set off from: and so shall you see by what poynt of the compasse the place assigned dooth beare from you. &c. If you would knowe howe farre the place assigned is from you, set the one foote of the compasses vpon the place you depart frō, & stretch out the other foote vnto the place assigned iust, that don (standing stil vnremoued) set them to the scale or trunk of measure, & that wil shew you iustly how many leagues it is iust from the place of your departing vnto the place assigned. If the distance betweene the. 2. places be more than the compasses will reach at once, then first set your compasses vnto the scale, opening the compasses vnto. 100. leagues more or lesse, as your scale and compasses will giue you leaue at your discretion, after that set the one foote at the place of your departing, & the other foote of the cōpasses right towards the place assigned, as often times as the distance betweene the. 2. places doth require, & therof (the cōpasses being opened vnto. 100. leagues) you may conclude it to be so many 100. leagues vnto the place assigned, as the cōpasses did shew vnto you: but if there be any od measure, thē opē your cōpasses to that quantitie, & set to them the scale, & it wyll shew you the

To knowe howe any place dooth beare from you by the Carde.

To knowe howe farre it is vnto any place by the Carde.

iuſt contente of that meaſure, more than ſo many. 100. leagues. &c. Furthermoze touching the third commodity, which is to knowe what Latitude any place aſſigned hath: ſet one foote of the compaſſes vpon the place aſſigned, and open the compaſſes vnto the nexte Eaſt and Weſt Line, then carie that vnto the line of degrees (keeping the foote of the compaſſes vpon the Eaſt and Weaſt line) it will ſhewe iuſtly the number of degrees that the Pole is aboue the horizon. So of theſe three wayes, by the firſt is knowne by what poynt of the compaſſe any place beareth from you. By the ſeconde is knowne howe farre diſtance it is vnto anye place aſſigned. And by the third is knowne in what heigth the Pole is in any place aſſigned. &c. (Now this being knowne) you maye with the more eaſe knowe howe to attaine to come vnto the port or place aſſigned. Yet furthermoze there is to be conſidered in (directing the courſe of a ſhip to any place aſſigned) what impedements may be by the way: as tydes, currentes, or the ſcantneſſe of the wynde, which may put the ſhip vnto the leewardes of his courſe, as alſo the ſurging of the Sea: And all this muſt be conſidered by the mayſter and Pilot of the ſhip. Likewiſe alſo in long voyages, the winde may often ſhifte vpon him, and ſometyme the wynde may be ſuch as he can not lye his courſe: wherefore he muſt keepe a perfect account of the ſhips way, and conſider to knowe what poynt the ſhip hath made hir way good by. And at euery time that the wynde doth ſhift, and the ſhip can not lye hir courſe, to note in the carde or plat in what place the ſhip may be: in hauing a ſpeciall regarde vnto the way of the ſhip, as touching the ſwiftneſſe or ſlowneſſe that the ſhippe goeth: and if ſo be the weather be cleare eyther by nyght or by day, to take the true Altitude of the Pole: for by that they may correcte the ſhips way, and giue a very neare geſſe, howe the place (aſſigned to go vnto) doth beare from them, as alſo how farre it is thither, ſauing onely in the Eaſte and Weaſte courſe: and then they haue no other helpe but onely the very account of the ſhippes way

To knowe what Latitude or heigth of the pole any place hath by the carde.

Things to be conſidered by the M. or pilote of a ſhip.

They may correct the ſhips waye by the taking the heigth of the Pole.

way. And to correct their deade reckening by the altitude of the Pole, they muſt doo this: (eſpecially if the ſhip haue had often trauerſe by the meanes of contrary windes, ſo that ſhe could not lie hir courſe,) conſider vpon the carde or plat howe long the ſhip hath made hir way good for ſo many points as the ſhip hath layld by: then (if by the altitude of the Pole the ſhippe hath gone more than the deade reckening did ſhewe you) repaire vnto the line of degrees, and ſet the one foote of the compaſſes vpon the degree and place of the heigth of the Pole, and the other vpon the next Eaſt and Weſt lyne: that done, beare it vnto the place you ſuppoſe the ſhippe to be in: & then bring forwardes with the other compaſſes, what point of the compaſſe the ſhippe hath layled by, and at the meeting of the. 2. payre of compaſſes, make a note for the place that the ſhippe is in: from which place you may with your compaſſes ſee, howe the place aſſigned (with) beare, and alſo howe farre off you be from the ſame. Furthermore (if you find by the heigth of the Pole that you are not ſo farre ſhot as your reckening did ſhewe vnto you) you muſt pull backe ſo much from the poynt that the ſhippe hath layled by, as the heygth of the pole doth ſhewe vnto you, by the order before reherſed &c. Furthermore (as I haue declared vnto you in the. 14. Chapter going before) to knowe howe farre the lande is off from you, knowing (as before) the diſtance betweene any 2. places by ſetting the land with your compas, you may doo the lyke by your carde, as thus: you ſetting the. 2. places with your compaſſe, do knowe that the. 2. places be ſo many leagues aſunder, then ſhall you repayre to the carde, and accoyding to the bearing of the. 2. placees by the points of the compas, you (being thwart of one of theſe. 2. places) ſhall replye it with your compaſſes vnto your ſcale: But for that in the ſcale the leagues be ſo ſmall, you may aſſigne. 20. leagues to be but one league, and open the compaſſes vnto that proportion that the. 2. places be aſunder, and the one of them doth beare from the other: that done, open the compaſſes a-

To knowe how far that the lande is of from you by the ſighte of the lande with youre compaſſe, to do it vpon the land.

gaine from the center of the compasse, vnto the place that you doo imagin to be the land, and then reply it vnto the trunke of measure, and you shall see how many leagues you be from the shore, and so forth. So that you may see that the Plat or Card is one of the necessariest thinges that is to be vsed in Nauigation. &c.

¶ *The. 20. Chapter is of the Longitude and declination of 32. notable fixed Starres of Nauigation, with Tables of their shinyng, and at what poynt of your Compasse they doo both rise and set: and also Tables for euery moneth of the yeare, declaryng at what houre and minute they be South, runnyng from the first day of the moneth, to the fifteene, and from the fifteene, to the last day, and wyll continue these hundred yeares without much errour.*

AND furthermore, I doo thinke it conuenient for diuers considerations, to shewe the longitude & declination of certaine of the moste notablest fixed Starres that are neare vnto the Equinoctiall, to the number of. 32. of them, whiche are very necessary for Nauigation in diuers respectes, as this: if you be vnto the North parts where the North pole is raised more than. 50. or. 60. degrees, then the North Starre is too hie to be obserued or taken with the Crosse staffe (as I haue declared in the first Chapter) and it may chaunce so, that in the daye the Sunne is not to be seene at noone, and then these Starres may serue your turne. And furthermore they be very good for them that haue occasion to trauell beyonde the Equinoctiall, where the North Pole is vnder the Horizon, in vsing their declination as they doo the Sunnes declination in all poyntes, which doth appeare in the. 7. 8. and. 9. chapters of this booke. And furthermore they be very necessarye for Seafaring men to knowe the houre of the nyghte both

If the Pole be rayled more than 50. or. 60 degrees, it is to hie be obserued by the crosse Staffe.

These stars wyl serue beyond the Equinoctial

both by their being vppon the Meridian, and also by their rising and setting: you may knowe the true tyme of their rising and setting in euery latitude by their declination from the Equinoctiall, whether they decline to the South partes, or Noyth partes, as is declared by the declination of the Sunne in the. II. chapter. And furthermoye by any of these Starres you maye trie the variation of your Compasse by night. &c. Nowe shall folowe the Table of all these Starres. The first row of this table conteineth the names of the Starres. The second, the Signes, what they be in longitude. The third, the degrees in the Signes. The fourth, the minutes belonging therunto. The fift, the degrees of declination. The sixt, the odde minutes belonging therunto. The seuenth sheweth towardes what part they decline, by letters, of which *S.* signifieth Septentrionall, or Noyth declination. *M.* signifieth Meridionall, or South declination: as in the Table doth appeare. The eight doth shewe nothing but the bignesse of the Starres. Now followeth the Table.

To knowe the rising & setting of these starres in al places, by the order of the. xi. chapter.

The order of the Table folowing.

A Table

A Table of the fixed Starres.

The names of the Starres.	Signes.	Longit. degr. mi	Declin. deg. mi.	To what part they decline.	Bigneſſe of the ſtarres.
Whales backe.	Aries	6. 6	12. 11	M	ſecond bigneſſe
Whales belly.	Aries	16. 2	12. 20	M	ſecond bigneſſe
Rammes horne.	Aries	27. 42	17. 19	S	third bigneſſe
Rammes head.	Taurus	1. 46	21. 16	S	thirde bigneſſe
Bulles eye.	Gemini	3. 42	15. 42	S	great Starres
Orions left foote.	Gemini	10. 12	9. 14	M	a great Starre
Orions left ſhoulder.	Gemini	11. 26	4. 37	S	a Starre of the
Firſt *Orions* Gyrdle.	Gemini	16. 22	1. 19	M	ſeconde light both
Orions right ſhoulder	Gemini	23. 6	6. 18	S	a great Starre
Great dogge.	Cancer	8. 40	15. 30	M	a very great ſtarre
Leſſer Dogge.	Cancer	20. 10	6. 4	S	a great Starre
Brighteſt in *Hydra*	Leo	21. 2	4. 47	M	ſeconde bigneſſe
Lyons necke.	Leo	23. 16	21. 59	S	ſecond bigneſſe
Lyons heart.	Leo	23. 32	14. 3	S	a great Starre
Lyons backe.	Virgo	5. 16	22. 30	S	ſecond bigneſſe
Lyons tayle.	Virgo	15. 32	16. 46	S	a great Starre
Rauens head.	Libra	5. 6	19. 53	M	of the third bignes
Rauens wyng.	Libra	9. 36	17. 8	M	both thoſe
Virgins ſpike.	Libra	17. 42	4. 54	M	a great Starre
twirt *Bootes* thighes.	Libra	18. 6	22. 9	S	a great Starre
South Balance.	Scorpi.	9. 2	13. 44	M	ſecond bignes
North balance.	Scorpi.	13. 12	7. 33	M	ſecond bignes
Scorpions heart.	Sagitta	3. 42	24. 47	M	ſecond bignes
Hercules head.	Sagitta	8. 42	15. 20	S	third bignes
Serpents head.	Sagitta	15. 52	14. 7	S	third bignes
The Eagle.	Capric.	24. 51	7. 28	S	ſecond bignes
Dolphines taile.	Aquar	8. 27	10. 1	S	third bignes
Goates taile.	Aquar	17. 22	14. 13	M	third bignes
Water pourers leg.	Piſces	2. 20	15. 52	M	third bignes
Pegaſus ſhoulder.	Piſces	17. 41	13. 1	S	ſecond bignes
Pegaſus leg.	Piſces	23. 10	26. 30	S	ſecond bignes
Whales taile.	Piſces	26. 21	21. 47	M	third bignes

The vse of this Table is this: when you haue taken the heigth of any of these starres vpon the Meridian, then looke what declination the Starre hath from the Equinoctiall: if the star haue North declination, then subtract or take away the stars declination from the heigth: if it haue South declination, then adde or put vnto the heigth, the starres declination, and that will shewe vnto you the heigth of the Equinoctiall, and then by the heigthe of the Equinoctiall, the heigth of the Pole is knowne, as the.7.Chapter doth declare. And now I thinke it conuenient to make certaine Tables, to shewe vnto you at what houre and tyme any of these starres be vppon the Meridian, wherby they maye the better knowe these Starres. I will also shewe vnto you howe long any of these Starres doo shyne or tarry aboue the Horizon in this Latitude from the Equinoctiall of London, that is at.51.or.52. degrees. And also at what poynte of the compasse any of these Starres do ryse or set, which will serue this.100. years without much error.

Howe to vse the starres declination, to know the height of the Pole.

¶ A Table to knowe the rysing and setting of these Starres, by what poynt of the compasse, and howe many houres they be aboue our Horizon, the Pole being rayſed. 51. or 52. degrees,

THe Whales backe ryseth East and by South, and vnto the Southwards: and shyneth. 10. houres and better.

The Whales belly (in a maner) as the whales backe.

The Rammes Horne riseth Easte Northeast, and setteth Weast Northwest: and shineth.15.houres.16.minutes.

The Rammes Heade ryseth East Northeast, and setteth Weast Northwest: and shineth.16.houres.4.minutes.

The Bulles Eye ryseth neare the Easte Northeast, and setteth neare the West Northwest: and shineth. 15. houres 2.minutes.

The Orions left foote riseth neare the East and by South, and setteth neare the West and by Southe: and shineth. 10. houres and. 6. minutes.

The Orions left shoulder ryseth East, and to the Northwardes, and setteth West and to the Northwardes: and shyneth. 12. houres. 45. minutes.

The firste in Orions girdle doth rise a little to the Southwardes of the East, and setteth a little to the Southwardes of the West: and shineth. 11. houres. 46. minutes.

Orions right shoulder ryseth East, and vnto the Northwardes, and setteth West and vnto the Northwardes: and shineth. 13. houres. 12. minutes.

The greate dogge riseth East Southeast, and setteth west Southwest: and shineth. 9. houres.

The lesser dogge riseth East and vnto the Northwardes, & setteth West & vnto the Northwardes: & shineth. 13. houres 10. minutes.

The bryghtest in Hydra ryseth East and vnto the Southwardes, and setteth West and vnto the Southwardes: and shineth. 11. houres. 7. minutes.

The Lions necke riseth East Northeast, and to the Northwardes, and setteth West Northwest and to the Northwardes: and shineth. 16. houres. 16. minutes.

The Lions hart riseth neare the East Northeast, and setteth neare the West Northwest: & shineth. 14. houres. 50. min.

The Lions backe riseth neare the Northeast and by east, and setteth neare the Northwest and by West: and shineth. 16. houres. 26. minutes.

The Lions tayle riseth neare the East Northeast, & setteth neare the West Northwest: and shineth. 15. houres. 12. minuts.

The Rauens head riseth neare the East Southeast, and setteth neare the west southwest: & shineth. 8. houres. 12. min.

The Rauens wing riseth neare the East Southeast, and setteth neare the the west southwest: & shineth. 8. houres. 50. mi.

The Virgins spike riseth east & to the southwardes, & setteth

teth West & to the Southwards: & shineth. 11. houres. 4. min.

Betweene *Bootes* thyes riseth neare the Northeast and by East, and setteth neare the Northwest and by West, and shineth. 16. houres. 20. minutes.

The South Ballance ryseth neare the East Southeast, and setteth neare the Weast Southwest: and shineth. 9. houres. 36. minutes.

The North ballance riseth neare the East & by south, and setteth neere the west & by south: & shineth. 10. houres. 38. mi.

The Scorpions heart riseth neare the Southeast, and by East, & setteth neare the Southwest & by West: and shineth 7. houres. 5. minutes.

Hercules head riseth neare the East Northeast, and setteth neare the West Northwest: & shineth. 14. houres. 56. minuts.

The Serpents head riseth neare the east Northeast, & setteth neare the west northwest: & shineth. 14. houres. 40. min.

The Eagle riseth neare the east and by North, and setteth neare the west and by North: and shineth. 13. houres. 24. min.

The Dolphines tayle riseth East and by north, and setteth west and by North: and shineth. 15. houres. 57. minutes.

The Goates taile riseth nere the east southeast, and setteth West southwest: and shineth. 9. houres. 20 minutes.

The water pourers leg, riseth neare the east southeast, and setteth West southwest: and shineth. 8. houres. 54. minutes.

Pegasus shoulders riseth neare the east Northeast, & setteth neare the West Northwest: & shineth. 14. houres. 32. minutes.

Pegasus legge riseth neare Northeast, and setteth neare Northwest: and shineth. 17. houres. 6. minutes.

The Whales tayle ryseth East southeast, and setteth west Southwest: and shineth. 7. houres. 48. minutes.

Furthermore, if you desire to know the time of any of these starres, beeing aboue the Horizon in all Latitudes, then repayre to the. 11. chapter. so you shall know it there, by their declination: euen by the same order that you knowe the Sunnes being aboue the Horizon, by the Sunnes declination.

The. 11. chapter will shewe howe long any of these starres will shine in all places.

A Table of the fixed Starres.

	These ſtars being ſouth frō the firſt day of Ianuary, vnto the. 15. day.			Ianuar. from the 15. day to the laſt			Februar. frō the 5. vnto the. 15.			Februa. from the 15. to the laſt.		
1	Whales backe.	5.20	E	1	4.20	DA	1	3.20	DA	1	2.20	DA
2	Whales belly.	5.54	E	2	4.54	DA	2	3.54	DA	2	2.54	DA
3	Rammes hoyne.	6.28	E	3	5.28	E	3	4.28	DA	3	3.28	DA
4	Rammes head.	6.45	E	4	5.45	E	4	4.45	DA	4	3.45	DA
5	Bulles eye.	8.52	E	5	7.52	E	5	6.52	E	5	5.52	DA
6	*Orions* left foote.	9.23	E	6	8.23	E	6	7.23	E	6	6.23	E
7	*Orions* left ſhoulder	9.28	E	7	8.28	E	7	7.28	E	7	6.28	E
8	Firſt *Orions* gyrdle	9.50	E	8	8.50	E	8	7.50	E	8	6.50	E
9	*Orions* right ſholder	10.12	E	9	9.12	E	9	8.12	E	9	7.12	E
10	Great dogge.	11.4	E	10	10.4	E	10	9.4	E	10	8.4	E
11	Leſſer Dogge.	12.0		11	11.0	E	11	10.0	E	11	9.0	E
12	Brighteſt in *Hydra*	12.4	M	12	11.4	E	12	10.4	E	12	9.4	E
13	Lyons necke.	2.12	M	13	1.12	M	13	12.12	M	13	11.12	E
14	Lyons heart.	2.13	M	14	1.13	M	14	12.13	M	14	11.13	E
15	Lyons backe.	3.0	M	15	2.0	M	15	1.0	M	15	12.0	
16	Lyons taple.	3.42	M	16	2.42	M	16	1.42	M	16	12.42	M
17	Rauens head.	5.2	M	17	4.2	M	17	3.2	M	17	2.2	M
18	Rauens wyng.	5.19	M	18	4.19	M	18	3.19	M	18	2.19	M
19	Virgins ſpike.	5.51	M	19	4.51	M	19	3.51	M	19	2.51	M
20	twixt *Bootes* thighs	5.56	M	20	4.56	M	20	3.56	M	20	2.56	M
21	South Balance.	7.16	M	21	6.16	M	21	5.16	M	21	4.16	M
22	North balance.	7.33	MD	22	6.33	M	22	5.33	M	22	4.33	M
23	Scorpions heart.	8.54	MD	23	7.54	MD	23	6.54	M	23	5.54	M
24	*Hercules* head.	9.14	MD	24	8.14	MD	24	7.14	MD	24	6.14	M
25	Serpents head.	9.41	MD	25	8.41	MD	25	7.41	MD	25	6.41	M
26	The Eagle.	12.19	DA	26	11.19	MD	26	10.19	MD	26	9.19	MD
27	Dolphines taile.	1.12	DA	27	12.12	DA	27	11.12	MD	27	10.12	MD
28	Goates taile.	1.48	DA	28	12.48	DA	28	11.48	MD	28	10.48	MD
29	Water pourers leg	2.48	DA	29	1.48	DA	29	12.48	DA	29	11.48	MD
30	*Pegaſus* ſhoulder.	3.47	DA	30	2.47	DA	30	1.47	DA	30	12.47	DA
31	*Pegaſus* leg.	4.12	DA	31	3.12	DA	31	2.12	DA	31	1.12	DA
32	Whales taile.	4.24	DA	32	3.24	DA	32	2.24	DA	32	1.24	DA

A Table of the fixed starres.

March frō the first to the. 15.			March frō the 15. to the last.			Apryl from the first to the. 15.			Apryl from the 15. to the last.			May from the first to the. 15		
1	1 23	DA	1	12,20	DA	1	11,20	MD	1	10.20	MD	1	9.20	MD
2	1.54	DA	2	12,54	DA	2	11,54	MD	2	10.54	MD	2	9.54	MD
3	2,28	DA	3	1,28	DA	3	12,28	DA	3	11.28	MD	3	10.28	MD
4	2.45	DA	4	1.45	DA	4	12.45	DA	4	11.45	MD	4	10.45	MD
5	4.52	DA	5	3.52	DA	5	2.52	DA	5	1.52	DA	5	12.52	DA
6	5 23	DA	6	4.23	DA	6	3 23	DA	6	2.23	DA	6	1.23	DA
7	5.28	DA	7	4 28	DA	7	3.28	DA	7	2.28	DA	7	1.28	DA
8	5.50	DA	8	4.50	DA	8	3 50	DA	8	2.50	DA	8	1.50	DA
9	6,12	E	9	5.12	DA	9	4.12	DA	9	3.12	DA	9	2.12	DA
10	7.4	E	10	6.4	DA	10	5 4	DA	10	44	DA	10	3.4	DA
11	8.0	E	11	7 0	E	11	6 0	DA	11	5.0	DA	11	4 0	DA
12	8.4	E	12	7 4	E	12	6 4	DA	12	5.4	DA	12	4 4	DA
13	10.12	E	13	9.12	E	13	8 12	E	13	7.12	DA	13	6.12	DA
14	10.13	E	14	9.13	E	14	8.13	E	14	7.13	DA	14	6 13	DA
15	11 0	E	15	10.0	E	15	9.0	E	15	8.0	E	15	7.0	DA
16	11.42	E	16	10.42	E	16	9.42	E	16	8.42	E	16	7 42	DA
17	1.2	M	17	12 2	M	17	11.2	E	17	10.2	E	17	9.2	E
18	1.19	M	18	12,19	M	18	11.19	E	18	10.19	E	18	9.19	E
19	1.51	M	19	12,51	M	19	11,51	E	19	10.51	E	19	9.51	E
20	1.56	M	20	12.56	M	20	11.56	E	20	10.56	E	20	9.56	E
21	3.16	M	21	2.16	M	21	1 16	M	21	12.16	M	21	11.16	E
22	3 33	M	22	2.33	M	22	1.33	M	22	12.33	M	22	11.33	E
23	4.54	M	23	3.54	M	23	2.54	M	23	1.54	M	23	12.54	M
24	5.14	M	24	4.14	M	24	3 14	M	24	2.14	M	24	1.14	M
25	5.41	M	25	4 41	M	25	3 41	M	25	2 41	M	25	1 41	M
26	8 19	MD	26	7.19	MD	26	6 19	MD	26	5.19	MD	26	4.19	M
27	9 12	MD	27	8 12	MD	27	7.12	MD	27	6.12	MD	27	5.12	MD
28	9.48	MD	28	8.48	MD	28	7.48	MD	28	6.48	MD	28	5.48	MD
29	10.48	MD	29	9 48	MD	29	8 48	MD	29	7.48	MD	29	6.48	MD
30	11,47	MD	30	10.47	MD	30	9.47	MD	30	8.47	MD	30	7 47	MD
31	12,12	DA	31	11,12	MD	31	10.12	MD	31	9.12	MD	31	8.12	MD
32	12,24	DA	32	11,24	MD	32	10.24	MD	32	9.24	MD	32	8 24	MD

A Table of the fixed starres.

May frō the. 15 day to the last.			Iune from the first to the. 15.			Iune from the 15. to the last.			Iuly from the first to the. 15.			Iuly from the 15. to the last.		
1	8.20	MD	1	7.20	MD	1	6.20	MD	1	5.20	MD	1	4.20	M
2	8.54	MD	2	7.54	MD	2	6.54	MD	2	5.54	MD	2	4.54	MD
3	9.28	MD	3	8.28	MD	3	7.28	MD	3	6.28	MD	3	5.28	MD
4	9.45	MD	4	8.45	MD	4	7.45	MD	4	6.45	MD	4	5.45	MD
5	11.52	MD	5	10.52	MD	5	9.52	MD	5	8.52	MD	5	7.52	MD
6	12.23	DA	6	11.23	MD	6	10.23	MD	6	9.23	MD	6	8.23	MD
7	12.28	DA	7	11.28	MD	7	10.28	MD	7	9.28	MD	7	8.28	MD
8	12.50	DA	8	11.50	MD	8	10.50	MD	8	9.50	MD	8	8.50	MD
9	1.12	DA	9	12.12	DA	9	11.12	MD	9	10.12	MD	9	9.12	MD
10	2.4	DA	10	1.4	DA	10	12.4	DA	10	11.4	MD	10	10.4	MD
11	3.0	DA	11	2.0	DA	11	1.0	DA	11	12.0		11	11.0	MD
12	3.4	DA	12	2.4	DA	12	1.4	DA	12	12.4	DA	12	11.4	MD
13	5.12	DA	13	4.12	DA	13	3 12	DA	13	2.12	DA	13	1.12	DA
14	5.13	DA	14	4.13	DA	14	3.13	DA	14	2.13	DA	14	1.13	DA
15	6 0	DA	15	5.0	DA	15	4.0	DA	15	3.0	DA	15	2.0	DA
16	6.42	DA	16	5.42	DA	16	4.42	DA	16	3.42	DA	16	2.42	DA
17	8.2	DA	17	7.2	DA	17	6.2	DA	17	5.2	DA	17	4.2	DA
18	8.19	DA	18	7.19	DA	18	6.19	DA	18	5.19	DA	18	4.19	DA
19	8.51	DA	19	7.51	DA	19	6.51	DA	19	5.51	DA	19	4.51	DA
20	8.56	DA	20	7.56	DA	20	6.56	DA	20	5.56	DA	20	4.56	DA
21	10.16	E	21	9.16	DA	21	8.16	DA	21	7.16	DA	21	6.16	DA
22	10.33	E	22	9.33	DA	22	8.33	DA	22	7.33	DA	22	6.33	DA
23	11.54	E	23	10.54	E	23	9.54	DA	23	8.54	DA	23	7.54	DA
24	12.14	M	24	11.14	E	24	10.14	E	24	9.14	E	24	8.14	E
25	12.41	M	25	11.41	E	25	10.41	E	25	9.41	E	25	8.41	E
26	3.19	M	26	2.19	M	26	1.19	M	26	12.19	M	26	11.19	E
27	4.12	MD	27	3.12	M	27	2.12	M	27	1.12	M	27	12.12	M
28	4.48	MD	28	3.48	M	28	2.48	M	28	1.48	M	28	12.48	M
29	5.48	MD	29	4.48	MD	29	3.48	M	29	2.48	M	29	1.48	M
30	6.47	MD	30	5.41	MD	30	4.47	MD	30	3.47	M	30	2.47	M
31	7.12	MD	31	6.12	MD	31	5.12	MD	31	4.12	MD	31	3.12	M
32	7.24	MD	32	6.24	MD	32	5.24	MD	32	4.24	MD	32	3.24	M

A Table of the fixed starres.

August frō the first to the. 15.			*August frō the 15. to the last.*			*Septem. frō the 1. vnto the. 15.*			*Septem. frō the 15. to the last.*			*Octob. frō the first to the. 15.*		
1	3.20	M	1	2.20	M	1	1.20	M	1	12.20	M	1	11.20	E
2	3.54	M	2	2.54	M	2	1.54	M	2	12.54	M	2	11.54	E
3	4.28	M	3	3.28	M	3	2.28	M	3	1.28	M	3	12.28	M
4	4.45	MD	4	3.45	M	4	2.45	M	4	1.45	M	4	12.45	M
5	6.52	MD	5	5.52	MD	5	4.52	M	5	3.52	M	5	2.52	M
6	7.23	MD	6	6.23	MD	6	5.23	M	6	4.23	M	6	3.23	M
7	7.28	MD	7	6.28	MD	7	5.28	M	7	4.28	M	7	3.28	M
8	7.50	MD	8	6.50	MD	8	5.50	MD	8	4.50	M	8	3.50	M
9	8.12	MD	9	7.12	MD	9	6.12	MD	9	5.12	M	9	4.12	M
10	9.4.	MD	10	8.4	MD	10	7.4	MD	10	6.4	MD	10	5.4	M
11	10.0	MD	11	9.0	MD	11	8.0	MD	11	7.0	MD	11	6.0	M
12	10.4	MD	12	9.4	MD	12	8.4	MD	12	7.4	MD	12	6.4	M
13	12.12	DA	13	11.12	MD	13	10.12	MD	13	9.12	MD	13	8.12	MD
14	12.13	DA	14	11.13	MD	14	10.13	MD	14	9.13	MD	14	8.13	MD
15	1.0	DA	15	12.0		15	11.0	MD	15	10.0	MD	15	9.0	MD
16	1.42	DA	16	12.42	DA	16	11.42	MD	16	10.42	MD	16	9.42	MD
17	3.2	DA	17	2.2	DA	17	1.2	DA	17	12.2	DA	17	11.2	MD
18	3.19	DA	18	2.19	DA	18	1.19	DA	18	12.19	DA	18	11.19	MD
19	3.51	DA	19	2.51	DA	19	1.51	DA	19	12.51	DA	19	11.51	MD
20	3.56	DA	20	2.56	DA	20	1.56	DA	20	12.56	DA	20	11.56	MD
21	5.16	DA	21	4.16	DA	21	3.16	DA	21	2.16	DA	21	1.16	DA
22	5.33	DA	22	4.33	DA	22	3.33	DA	22	2.33	DA	22	1.33	DA
23	6.54	DA	23	5.54	DA	23	4.54	DA	23	3.54	DA	23	2.54	DA
24	7.14	DA	24	6.14	DA	24	5.14	DA	24	4.14	DA	24	3.14	DA
25	7.41	DA	25	6.41	DA	25	5.41	DA	25	4.41	DA	25	3.41	DA
26	10.19	E	26	9. 19	E	26	8.19	E	26	7.19	E	26	6.19	E
27	11.12	E	27	10.12	E	27	9.12	E	27	8.12	E	27	7.12	E
28	11.48	E	28	10.48	E	28	9.48	E	28	8.48	E	28	7.48	E
29	12.48	M	29	11.48	E	29	10.48	E	29	9.48	E	29	8.48	E
30	1.47	M	30	12.47	M	30	11.47	E	30	10.47	E	30	9.47	E
31	2.12	M	31	1.12	M	31	12.12	M	31	11.12	E	31	10.12	E
32	2.24	M	32	1.24	M	32	12.24	M	32	11.24	E	32	10.24	E

October

A Table of the fixed starres.

Octob. frō the 15. to the last.			Nouem. frō the first to the. 15.			Nouem. frō the 15. to the last.			Decem. frō the first to the. 15.			Decem. frō the 15. to the last.		
1	10.20	E	1	9.20	E	1	8.20	E	1	7.20	E	1	6.20	E
2	14.54	E	2	9.54	E	2	8.54	E	2	7.54	E	2	6.54	E
3	11.28	E	3	10.28	E	3	9.28	E	3	8.28	E	3	7.28	E
4	11.45	E	4	10.45	E	4	9.45	E	4	8.45	E	4	7.45	E
5	1.52	M	5	12.52	M	5	11.52	E	5	10.52	E	5	9.52	E
6	2.23	M	6	1.23	M	6	12.23	M	6	11.23	E	6	10.23	E
7	2.28	M	7	1.28	M	7	12.28	M	7	11.28	E	7	10.28	E
8	2.50	M	8	1.50	M	8	12.50	M	8	11.50	E	8	10.50	E
9	3.12	M	9	2.12	M	9	1.12	M	9	12.12	M	9	11.12	E
10	4.4.	M	10	3.4	M	10	2.4	M	10	1.4	M	10	12.4	M
11	5.0	M	11	4.0	M	11	3.0	M	11	2.0	M	11	1.0	M
12	5.4	M	12	4.4	M	12	3.4	M	12	2.4	M	12	1.4	M
13	7.12	MD	13	6.12	M	13	5.12	M	13	4.12	M	13	2.12	M
14	7.13	MD	14	6.13	M	14	5.13	M	14	4.13	M	14	2.13	M
15	8.0	MD	15	7.0	M	15	6.0	M	15	4.0	M	15	4.0	M
16	8.42	MD	16	7.42	MD	16	6.42	M	16	5.42	M	16	4.42	M
17	10.2	MD	17	9.2	MD	17	8.2	MD	17	7.2	M	17	6.2	M
18	10.19	MD	18	9.19	MD	18	8.19	MD	18	7.19	M	18	6.19	M
19	10.51	MD	19	9.51	MD	19	8.51	MD	19	7.51	MD	19	6.51	M
20	10.56	MD	20	9.56	MD	20	8.56	MD	20	7.56	MD	20	6.56	M
21	12.16	DA	21	11.16	MD	21	10.16	MD	21	9.16	MD	21	8.16	MD
22	12.33	DA	22	11.33	MD	22	10.33	MD	22	9.33	MD	22	8.33	MD
23	1.54	DA	23	12.54	DA	23	11.54	MD	23	10.54	MD	23	9.54	MD
24	2.14	DA	24	1.14	DA	24	12.14	DA	24	11.14	MD	24	10.14	MD
25	2.41	DA	25	1.41	DA	25	12.41	DA	25	11.41	MD	25	10.41	MD
26	5.19	DA	26	4.19	DA	26	3.19	DA	26	2.19	DA	26	1.19	DA
27	6.12	E	27	5.12	E	27	4.12	E	27	3.12	DA	27	2.12	DA
28	6.48	E	28	5.48	E	28	4.48	E	28	3.48	DA	28	2.48	DA
29	7.48	E	29	6.48	E	29	5.48	E	29	4.48	E	29	3.48	DA
30	8.47	E	30	7.47	E	30	6.47	E	30	5.47	E	30	4.47	E
31	9.12	E	31	8.12	E	31	7.12	E	31	6.12	E	31	5.12	E
32	9.24	E	32	8.24	E	32	7.24	E	22	6.24	E	32	5.24	E

NOw this table serueth for euery monthe in the yere (being exactly calculated) the time of their beeing South, or touching your Meridiã, or (as some terme it) Noonestead, serving very well the Seamen to take the heigth of them with their instrumẽts vpon the Sea, referring it vnto the table of declination that goeth before: the first is the houres, the secõd the minutes, the thirde be the letters that shewe you whether they be South by day or by nyght, in the euening or morning, in the forenoone or afternoone, of which the letter E doth signifie Euening, the letter M signifieth Morning, the letters D M. signifieth day in the Morning, and the letters D A signifieth day in the afternoone (as I sayd before) the very houre and minute of their beeing South. Nowe you see that I haue put to their beeing South in the day, as well as in the nyght, to the intent to know the houre of the night, as well by their setting, as also by your compasse, which I shewed you in the first Chapter or rule, namely to bring your .32. pointes into 24. houres: & in like maner, in the fourth chapter by shining of the Moone to deuide the shining into equall partes, then those partes (beeing equally deuided with the houres minuts) and the tyme before their beeing South, put togither the half that shineth, and that sheweth the iust riling of those starres: and the other tyme of their shining after their beeing South, sheweth their setting (as I declared in the rule of the shining of the Moone.) Nowe you, seeing the table runneth from the first day of euery monthe, to the .15. from the .15. to the last daye, muste consider (if you will knowe the exacte tyme betwixte the first day or the .15. day, & betwixt the .15. day and the last) to doo this, looke how many dayes of the monthe is past eyther from the first day or .15. day, and pull foure minutes from that number: for so many dayes as is past, for euery day that shal shew you the true time of their beeing South. That knowne, you shall doo (as is afore sayde) for their riling and setting.

The signification of the letters in the table.

¶ The. 21. Chapter sheweth you the making of a generall instrument, to knowe the houre of the day by throughout all the worlde.

NOwe for the making of your instruments for the Sea, with their vses, you shall repayre to the booke of Nauigation, made by Martin Curtise a Spaniard, Imprinted by M. Iugge Printer to the Queenes Maiestie: else I would haue shewed you the making of diuers instrumentes, as also the making of the equinoctiall diall, with his vse, which is very profitable to knowe the houre of the day by, in all Latitudes through the whole worlde, for your compasse is not to knowe the houre of the daye by in Sommer, neyther in the Morning nor Euening, neyther can you knowe when the Moone is east or West, she hauing North declination, as being in the signe of *Taurus*, *Gemini*, *Cancer*, or *Leo*: bycause your compasse standeth flatte, as doth your Horizon. Wherfore it is very good for Seamenne to vse the Equinoctiall dials, for that it sheweth them the true houre of the day, in all Latitudes, and also the Moone doth giue a true shadowe in that Diall in all Latitudes, for I doo knowe, that Seamenne are very many tymes deceyued, where it doth flowe an East and West Moone, or any poynt betweene the Southeast and Northest. Bycause in setting the Moone with their compas, (beeing in the North signes) she seemeth to be East by the Compasse, when she is neare the East Southeast in hir course: and in lyke manner, when the Moone seemeth West by the compasse, she shall be a little more than Weast southeweast in hir course: which is a verye perillous matter vnto them that should put into a tide, harborowe, or hauen, where he knoweth there is water ynough for him, if that he dothe come at a full Sea, and then by the error of the Moones shadowe of the compasse he is deceyued: and when he findeth the error, he thinketh that the cause thereof commeth by the occasion

The Sunne and Moone dooth giue a full shadowe by the compasse.

The Equinoctiall diall giueth a true shadowe all the worlde ouer.

A perilous matter.

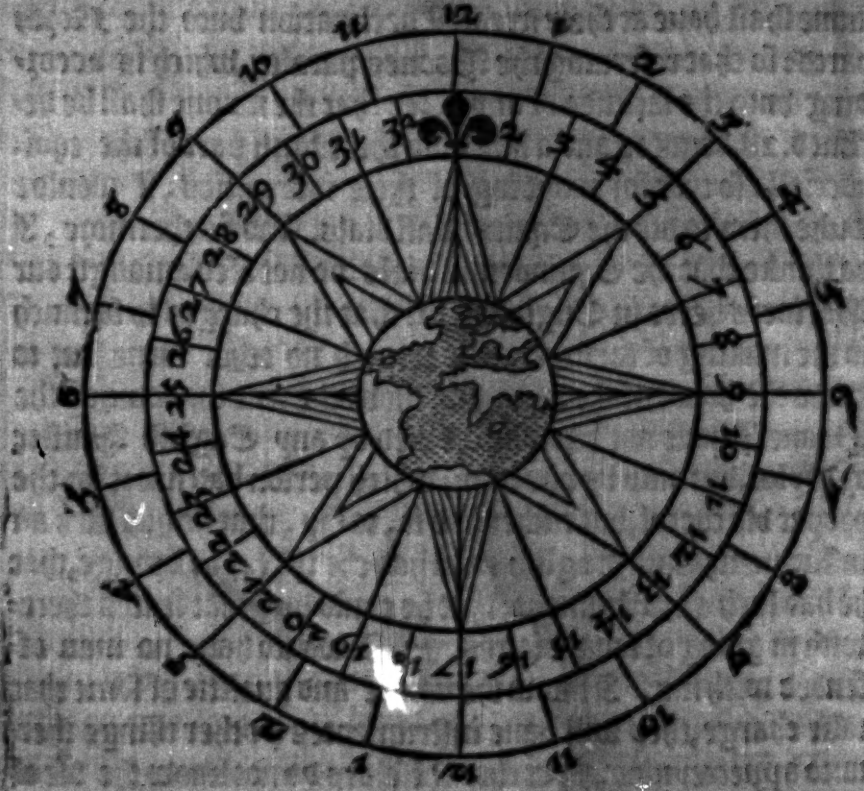
casion of some storme of wynde that is lyke to followe, imputing vntoo it that the tyde dothe not keepe hys course, whereas the verye cause groweth by no other meanes, but of receyuing a false shadowe, by the Horizontall compasse: and especially, if the Moone be neare hir greatest declination vnto the North partes, that is in the signe of *Gemini* and *Cancer*. And also that effect is most preferred, if the Dragons head be in the beginning of the signe of *Aries*: for that then, if the Moone be in the beginning of *Cancer*, she shalll haue 5. degrees more in declination from the Equinoctiall, than the sunne shall haue at their greatest declination vnto the North parts: so that reseruing the Moones paralex, which is accrording vnto the latitude of any place that the moone shall be declined, 28. degrees and a half vnto the North part of the equinoctiall: so that for auoyding of these infirmities, I wouldе wishe them to vse the Equinoctiall dials. And furthermore, I do thinke that the Equinoctiall dials be not vsed amongst our Mariners heere in Englande, for that the charges is so much in the making of them, & yet it serueth no other turne but to know the houre of the day, & to show the true shadowe of the Moone. I haue not knowne thē vsed by any English Maister or Pylot, but only by one man, which person had not it for the proper vse therof, but rather had it, to say, that he had such an instrument, as no English man had the lyke, & to bragge, that he had such an instrument, that he could do great feates therewith in going of long viages. &c. I would haue no man offended with me. I know the nature and qualitie of some that take charge, they will haue instrumentes & other things therunto apperteyning, & yet they thēselues do not know the vse of thē, yet they will seeme to be cunning, & that they neede no instructiōs of any man, for that they know all things, & yet in respect know nothing. (But notwithstanding) I would wish them that be Seafaring men, to vse themselues to the Equinoctiall dials: for that they doo serue two notable turnes, as well at home in these our chanels, as also in long viages: they

The Moone may decline 28. degrees and a halfe from the Equinoctiall.

Of men that will haue instruments, and knowe not the vse of them.

maye make them with a verye easie charge: for whereas in the Arte of Navigation it is shewed howe to make them in brasse, they make them with woode in this manner: take a peece of boordes ende of sixe ynches broade, more or lesse, at youre discretion, and halfe an ynche in thickenesse, then hauing cutte it rounde, and playned it smoothe, you maye eyther graue in it the .32. poyntes of the compasse, or elsse paynt them vpon it, with some colours, with the .24. houres, vpon both the sides: as this figure sheweth.

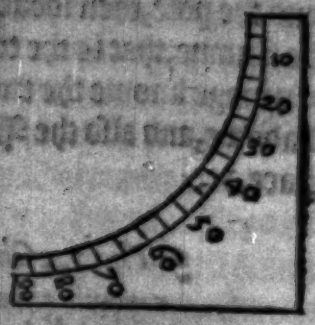
An easie way to make an equinoctiall dial with little charge.



That done take a wyre of iust the Diameter of the Instrument, then put it through the middle or centre of the Instrument, then make it faste, that the one ende be halfe waye thorroughe on the one side, and the other halfe on the other side, this done make a frame with three peeces of boordes endes, to

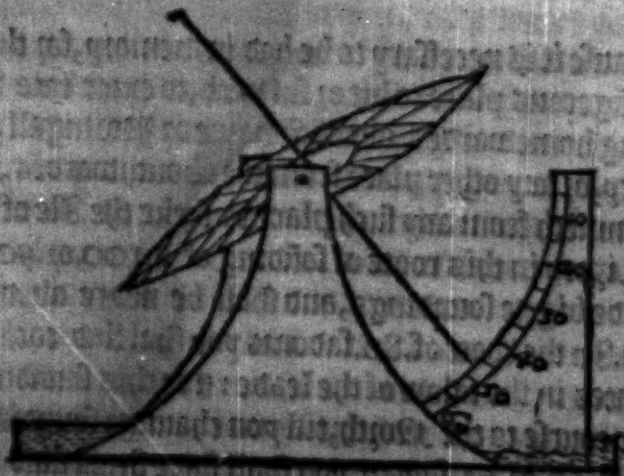
hang

hang the diall or instrument vpō, with one pinne on the East poynt, and an other on the West poynt: then take an other peece of boardes endes being square, and with a paire of compasses strike a quarter of a circle, of iuste the bignesse of the quarter of the diall, and cutte all that away, and then the rest of the square that is left, (at the edge of the quarter of the circle) deuyde into. 90. equall partes marking it thus. 10. 20. 30. 40. 50. 60. 70. 80. 90. as in this



foxme: last of all let this be placed in the middle of the frame, so that. 90. may stand right vnder the very middle of the dial, and there made fast, in suche foxme that the very ende of the wyer when the diall is put vp, and downe may touche the hollow parte that you see cut away, which is caled the Directer, and so it is finished, and will stand altogether in this foxme.

The Equinoctiall Diall.



The vse of this Diall is most necessary in a shippe, for that you haue occasions to transporte your selues into all the clymates. And to know the true houre of the day, doo this: set this Diall by your compasse (the Directer vnto the Southwardes) and then (you knowing how hie the pole is aboue the Horizon) set the ende of the wyer right against that degree, in the Directer, and the other ende of the wier will poynt iuste vnto the pole, then looke what shadowe the wier doth giue by the Sunne, that is the true houre of the day. In lyke manner you maye knowe the true houre of the night by the Moones shadowe, and also the Moone will giue a true shadowe of hir place, &c.

¶ *The. 22. Chapter treateth of the soundings, comming from any place out of the occident Sea, to seeke Vshant or the Lyzarde, and so al alongst, til you come to the coast Flaunderes: with other necessary matters to be knowne to them that be Chanmellers, that doth occupy or deale amongst sandes, bankes, or such other like.*

BEcause it is necessary to be had in memory, for that it is a dangerous place to hit or fal with, to enter into the sleue, comming homewardes out of Spaine or Portugall, or from Barbary, or any other place from the Southwardes, a shippe that commeth from any such place to seeke the Ile of Vshant, or the Lizard in this roote of sounding of .100. or .90. fadoms shall finde bigge soundings, and shall be neare aboute to the seames. In the roote of .80. fadoms you shal find cockle shels, and dentes in the talow of the leade: & in this sounding, holde on your course to the North, till you chaunge sounding, then if you be at .60. or .64. fadom, you shall finde small sand and Mathey grounde, and shall be neare the coaste of Vshant. If you haue time and day goe seeke it in the Northeast, and you shall be

The sounding neare vnto Vshant and the Lizard.

be about.10.leagues from the Ile. If you come making your course about Balefreede, you shall finde course sande, red and browne, and you shall haue sounding at. 40. fadom: if you be towardes the banke of Silley, you shall haue soundings at 86.or.90.fadom, & you shall finde in the tallow stony grounde, and shall be well shotte towardes the banke of Silley. When you be at.80.fadom, you shall finde small blacke sande, and shall be well towardes the Lizarde. When you be at. 60. or 64.fadome, you shall finde white sande, & white softe wormes, and shall be very nie to the Lizarde. Betweene the cape of Cornwall, and Vshant amidde the channell, you shall finde 70.fadome, & neare ynough. Betweene Dodmon & the Foyne, in the channell you shall haue .40. or. 50. fadom. If you be thwart of Plimmouth or the Starte, you shall finde streamie ground, & dentes in the talow, & soundings.41.or.42.fadoms, At the cõming from Portland you shall haue.35.fadoms, and small shingles. And when you be nie to Portland.30.fadoms. & stones like beanes: & this sounding will last till S. Alban, & in the sayd soundings you shall finde white stones like brokẽ Aules, & other that be bigger, & then you shall be thwart of S. Alban, or of the Ile of Wight. Two or.3.leagues frõ the Ile of Wight, you shall finde.25.fadom, with dentes & clefts in the tallow like small threeds. 2.or.3.leagues frõ the Calketes, you shal finde.40.fadome, & bigge stones ragged and blacke. Between the Ile of wight & the hagge, the deepest is but .35. or.40.fadome. Betweene the Ile of wight and Lantarga the deepest is but.25.or.30.fadom. Between Beachy & the Ile of Wight a league from the land, you shall finde.38.fadom, and poppell as bigge as beanes. Betweene Fairely and the water of Summe in the deepest, but.25.fadom. Betweene Folkestone and Bollayne, is a banke that is called Rippe rappe: & lieth in the midde way betweene Pickardie and Englande: and harde aboyde by it, is.26.or.27. fadome. In the straighte of Calice is.30.fadom, in the roade of Calice is.16.fadõ. And alongst the coast of Flanders, is but.20. fadom the deepest.

The sounding in the channell.

Thus

The heigth of the pole at the entrance of the sleeue.

Thus much haue I sayde for the enterance of the Sleeue, to come to the riuer of Thames, and in the entrance in the midwaye betweene Vshant and the Lizarde the pole Artick is eleuated. 50. degrees and a half, and the Equinoctiall is lifted aboue the Horyzon. 39. degrees and a halfe. And furthermore for them that are channellers and occupiers amongst sandes and bankes and such other lyke, they must haue consideration of these things following. As this: first (if you knowe how the channell doth lie right betweene any. 2. sandes) you must view the lande to take some markes of it, in this manner, to be a leading marke. And that you shall doo thus: looke something that standeth farre into the lande, that you maye knowe it well, beeing ryght open with the channell of the sandes, then take another marke, neare vnto the waters side, and the one to be right against the other, when that you be in the middle of the channell, and then you knowing these two markes well, they will be leading markes vnto you for euer to keepe that channell. And then furthermore, if it doothe so happen that the channell doth turne to keepe another course, or else (some other daunger lying in the way) you must haue a thwarte marke, to knowe both when that you are cleare of any daunger, and also when that you are open of an other channell, and that you shall do as before is declared, to take some marke within the lande, and also an other neare vnto the sea, water, or riuers side, to be youre thwarte marke when you bring them both together. And this is moste specially to be noted: that these markes be very pare, and good when the one is farre distante from the other: and those markes very slowe and asketh some distance in sayling to open and shette them, which are neare together vpon the lande. And furthermore, for them that are Channellers or occupiers amongst sandes, for that the weather is not alwayes cleare, when they haue occasion to passe through such places, it is good for them to sounde the channelles perfitly, and to knowe by the depthe, what side of the channell they are vpon, and also howe farre

Necessary things to be noted for them that are Channellers and dealers amongst sandes.

they

they are shotte into that channell. And also in like manner to know by the sounding of any of the sides of the channell, whether they be neare any of the sandes or daungers, or any breadth of: for that some sandes or daungers there be hauing fayre or good soundings or shaldings, that they may borrow of & on at their pleasure. There be againe some sandes & daungers that there is no borrowig nor sounding of them, and those be neall or deepe harde vnto the sandes or daungers: for that the water is deepe harde vnto the sande: and these are verie daungerous sandes for any shippe to come neare, for that they shall haue the water verie deepe, and by and by be a grounde. Yet furthermore it is verie good for them that be channellers and occupiers amongst sandes, to know which way the tide doth set at euery time of the tide: for that many times it happeneth so, that when the sandes be vnder the water, the tide doth set crosse the channell, which is a daungerous matter, if it be not very well considered by the Master or Pilote. &c.

¶ *The. 23. Chapter is as touchyng the variation of the Compasse, called the Northeastyng and the Northwestyng of the Compasse: and howe to giue a gesse to knowe the Longitude.*

AS touching the variatiō of the cōpas called the Northeasting or Northwesting, it is supposed that the compasse doth varie by proportiō, in the sayling to the Eastwards or westwardes: and (as I haue declared in the end of the. 6. chapter) if it varieth by proportiō that the North poynt is varied one poynt from the North at. 22. degrees & a halfe, and so vntill the North point doth stand Northeast or Northwest. And that is, when you are. 9. degrees from the Meridian that the compas was made at to the Eastwards or Westwardes. Some also are of an other opiniō, that the compas doth varie

Of the cōpasse to varie to euen proportion.

Of the compasse to vary by no proportion.

by no proportion, but doth vary according vnto the nature of some kinde of mineralles, that is, in some country or some kynde of Ilandes, that drawe the Compasse by the mines of the Loadestone or Magnes stone that they touch their compasse with when they make them. And furthermore the booke of Martine Curtile, (called the arte of Nauigation) sayeth that the compasse doth vary by proportion, in this maner: which is, by the proportion of a circle: for that the North poynt doth alwayes poynt vnto a place in the heauens that is vnmoueable, and therfore as you do transporte your selfe to the Eastwarde or Westwarde, the North poynt doth still poynt vnto that place in the heauen: wherfore (as he sayeth) when you bee. 90. degrees in Longitude from the place of the making of your compasse, that is, when you be one quarter of the circumference of the earth, in that paralell the compasse will be varied. 4. poynts from the North: and as you do transporte your selfe further, then the North poynt of the compasse will come nearer and nearer vnto the North: and when you are iust halfe the circumference of the earth, that then the North poynt will stand due North vpon the pole agayne: for that you are come to the same Meridian agayne vpon the opposite part of the earth, (as it doth appeare in the third part and. 5. chapter of the sayd booke of Martine Curtile) but if that be true, then the compasse doth vary swiftly at the first, and slowly afterwardes, in order like vnto the Sunnes declination: by which (if it be true) they may very well knowe what order the compasse doth vary by, and so by the variation you maye giue a neare estimacion of the Longytude, and knowe in howe many degrees the compasse is varyed one poynt, two poynts, three poynts, and so the greatest varyation which is foure poynts. Now to know the proportion, doe this: First, make a circle with a payre of compasses, and stryke a lyne by the Center to the circumference, which shall be your Meridian lyne, then stryke another lyne by the Center a crosse, that you may deuide the circle into foure

Of the compasse to vary according vnto the proportion of a circle, that is swiftly and slowly.

equall

equall partes, and then (for that fourtie fiue degrees is the greatest variation) set fourtie fiue vnto the East parte and West parte, deuiding euery one of the quarters of the Circle into fourtie fiue equall partes, according to the greatest variation: then make an other Circle of that Diameter, that the circumference touche that Center of the Circle: and deuide it as you deuide the Compasse, after the rate of two and thirtie poyntes, although you neede not deuide but that side to the Northwardes, and then the Northeast and Northwest poynt wyll fall vpon fourtie fiue degrees: that done, drawe lines according to the poyntes of the Compasse vnto the Eastwardes or Westwardes, and looke howe they fall vpon the lyne that commeth from the Center of the other Circle, of whiche euerye quarter is deuided into fourtie fyue equall partes: and then (at the very place that the lyne doothe touche) drawe paralell lynes in that Circle by proportion at the very place too the Eastewardes or Westwardes that the lyne of the compasse falleth vpon: and that will shewe you iustly how many degrees you shall transporte your selfe vnto the Eastwardes or Westwardes for the baryng of the first poynt, secounde poynt, and thyrde poynt: and in lyke manner the greatest variation whiche is the fourthe poynt. So that (according to that order) it will fall out in this manner, that the Compasse will be baryed one poynt at neare eleuen and $\frac{1}{2}$. It will be baried two poynts neare about foure and twenty degrees and a halfe. It will be baried three poyntes at fourtie twoo degrees, and about a halfe. But it will not be baryed the fourth point vntill you be foure score and tenne degrees from the Meridian that the compasse was made at: which is a very slow baryng, being .47. degrees and $\frac{1}{2}$. before the compasse doothe bary one poynt, and betweene the third poynt and the seconde poynt, beyng .18. degrees for the baryng of that poynt, and then from the second poynte vnto the first poynte is .13.

To know in how many degrees going vnto the Eastwarde or Westwarde that the compasse doth bary one poynt or .2. poynts or .3. points &c.

To knowe howe many degrees is in the baryng of one point.

is.13.degrees and better, & last of all from the varying of one poynt to the Meridian it is.11.degrees and $\frac{1}{7}$ parte, euery degree beyng according to the paralel you are in, which doth alter according vnto your Latitude from the Equinoctial: for vnder the Equinoctiall it is.60. English miles, or.20. English leagues vnto one degree. In the Latitude of.90.degr. from the Equinoctiall there in that paralel, it is but.30. myles, or.10. English leagues vnto one degree.&c.as it is plainely shewed in the.16.chapter of this booke, wherin is an instrument shewing you howe many myles of Longitude will answere vnto a degree in euery seuerall Latitude by the replying of a threed, at your discretion: so that I conclude, if the compas doth varie by that order of proportion that Martine Curtise doth attribute vnto it, you may giue a neare ghesse to finde the Longitude by the varying of the compas being neare vnto the Meridian that the compas was made for. But if you be very farre from the Meridian that the compas was made for, then the variation is so slowe, that you can haue no iudgement at all (by the variation of the compas) to finde any Longitude. And furthermore if the compas doth varye by that proportion that Martine Curtise doth affirme, I am of that opinion, that there may growe some errour in proportion in those compasses that are made for any Meridian: for those compasses that are made here with vs in Englande, whereof the needle doth stande.4. or.5.degrees vnto the Eastwards of the North (as doth appeare by al the needles made for dials & also in the compasses) if they would haue the North poynt to stande due North, then the ende of the wyers vnder the carde of the compasse should stande foure or fyue degrees vnto the Eastwards of the Flouredeluce: wherefore it maye be doubted, that the compasse maye vary more the one way than it will the other way, by that proportion that the ende of the wyre doth stand beside from the North poynt. For (if in the greatest variation) the end of the wyre (vnder the carde of the compasse) doth stande Northwest, the flouredeluce

If you will knowe howe many leagues a degree is, repayre to the 16. chapter.

There may growe some errour in the proportion of the varying of the Compasse.

deluce of the compasse should stande neare halfe a poynt to the Westwardes of the North west. And in like manner at the greatest variation, if the ende of the wyre doth stande North-east, then the Floure deluce should stande neare halfe a poynt vnto the Northwards of the Northeast. &c. And furthermore heere is one thing that I coulde neuer vnderstande the truth of, and yet I haue oftentimes demaunded the question of dyuers that haue been in the West part, in the bay of *America*, and that is this: Whether in the compasse there made, or in the dials that are there made: the endes of the Nedles doe stande due North, or not: and yet it hath not beene my chaūce to meete with any that can tell. For if it be so that those Nedles that are there touched, doe stand due North, then it were very good for them that should occupie long trauerse vnto the Westwarde or Eastwarde, to haue diuers compasses ready made with the Needle of them vntouched, and to carie a good Lodestone with them to touche those compasses, when the compasse hath the greatest variation. It is good for these two causes: the one cause: it is the better to direct your course by. But this cause is very speciall, to giue a neare gesse of the Longitude, that is to say, the compasse will varie more quickly (according to the order before written) by which you see they may transporte themselues further vnto the Eastwards or Westwardes, before that the compasse dothe varie one poynt, than it doth for the other three poyntes, so that they are not able to giue any estimation at all, by the varying of the compasse, to knowe any Longitude: for that they may trauel more than the quarter of the circumference of the earth, before the compasse will be varied one poynt backewardes and forwardes. And I doo verye much maruell at this, (considering how many times English men haue bene in the west Indies) that I can meete with no man that can tell whether the needles of the Dials or compasses made there, doo stande due Northe or not: whiche is a thing that maye be easily knowne. For the needles of the Dials it is soone seene, and in

Thinges that I can not know.

Of slowe varying of the cōpasse.

How easy it is to knowe whether that the compasses made in the West Indies do stand due North

like maner of the Compasses: for if the needle of the Compasses there made, wyll not stand due North, then it is reformed vpon the Carde of the Fyre of the Compasse, as if the Northend of the wyers doo stand Northeast, then they wyll set northeast ouer it, euen as wee doo set the ende of the wyers of the Compasses with vs, made neere halfe a poynt to the Eastwardes of the north. &c. And furthermore it is verye good for them that are Maisters or Pilots of shippes, to note,

Of makyng notes of the variation.

when they doo fall with any lande where the Compasse is varied, to make a remembrance in a booke, how many poyntes and degrees the Compasse is varied in euery place where they come vnto, which wyll be a great helpe for them, to finde that place againe. And to finde the variation, it is declared in the first chapter.

And here I leaue to trouble thee any further for this tyme: but shortly after this, looke for two other workes of myne, the one called, *The Shootyng in great Ordinance*, and an other named, *A Treasure for Trauellers*: whiche two bookes wyll be profitable, I trust, for al men. If these my labors may profit my Countrey, then haue I my desire. And thus I byd thee moste hartily farewell.

FINIS.

The Table of the contents of this booke.

FINIS.

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